

# ORAL HEALTH *in* TEXAS

## 2008





# TABLE *of* CONTENTS

---

Executive Summary.....	1.1
Introduction .....	2.1
Public Health in Texas .....	2.1
Oral Health in Texas.....	2.2
National and State Objectives on Oral Health .....	3.1
Oral Health in America.....	3.1
<i>Healthy People 2010</i> .....	3.2
Call to Action.....	3.2
DSHS Oral Health Program.....	3.2
State Profile.....	4.1
Demographics .....	4.1
Access to Care .....	4.4
The Burden of Oral Diseases.....	5.1
Prevalence of Disease and Unmet Need in Oral Health.....	5.1
Disparities.....	5.6
Societal Impact.....	5.9
Economic Impact .....	5.10
Oral Disease and Other Health Conditions.....	5.10
Risk and Protective Factors Affecting Oral Disease.....	6.1
Community Water Fluoridation .....	6.1
Topical Fluorides and Fluoride Supplements .....	6.2
Dental Sealants.....	6.3
Preventive Visits .....	6.5
Screening for Oral Cancer.....	6.7
Tobacco Control.....	6.8
Oral Health Education.....	6.9
Oral Health Coalitions .....	6.10
Provision of Dental Services.....	7.1
Dental Workforce and Capacity .....	7.1
Dental Workforce Diversity .....	7.3
Use of Dental Services .....	7.4
Special Populations.....	7.4
Dental Medicaid and State Children’s Health Insurance Programs.....	7.5
Community and Migrant Health Centers and other State, County, and Local Programs.....	7.6
Conclusions.....	8.1
References .....	9.1
Appendices .....	10.1
Acknowledgements .....	11.1



## INDEX of TABLES and FIGURES

---

### TABLES

Table 1	<i>Healthy People 2010</i> Oral Health Objectives: Targets and Progress: U.S. and Texas 3.3
Table 2	Condition of Teeth and Preventive Dental Care: U.S. and Texas ..... 5.2
Table 3	Dental Caries Experience and Untreated Dental Decay Among 6- to 8-year-old Children: U.S. and Texas .....5.2
Table 4	Texas DSHS Oral Health Program and Medical Expenditures (\$) FY 02 to FY 06 .....5.10
Table 5	Percentage of Eight-year-old Children with Dental Sealants on Molar Teeth.....6.4
Table 6	Percentage of Adults Aged 18 or Older Who Had Their Teeth Cleaned Within the Past Year (2006) .....6.6
Table 7	Expected New Cases of Oral and Pharyngeal Cancer Among Adults Aged 40 and Over in Texas.....6.7
Table 8	Cigarette Smoking (Every Day) Among Adults Aged 18 and Older.....6.8
Table 9	Percentage of Students in High School Who Smoked Cigarettes or Who Used Chewing Tobacco/Snuff One or More of the Past 30 Days (2007) .....6.9
Table 10	Dentists Per 100,000 Residents by Region and DHPA Designation in Texas .....7.2
Table 11	Proportion of Persons Who Visited a Dentist in the Previous 12 Months .....7.4
Table 12	THSteps Eligibles Accessing Dental Services, Ages 1–20.....7.6

### FIGURES

Figure 1	Population by Race/Ethnicity ..... 4.1
Figure 2	Population by Age ..... 4.2
Figure 3	Population Density ..... 4.3
Figure 4	Adults with 1 or more Teeth Removed by Sex..... 5.4
Figure 5	Adults with 1 or more Teeth Removed by Race/Ethnicity ..... 5.4
Figure 6	Oral Cancer Death Rate by Sex/Race/Ethnicity ..... 5.6
Figure 7	Caries Experience by Medicaid Status and Grade..... 6.5
Figure 8	Prevalence of Untreated Decay by Medicaid Status and Grade ..... 6.5
Figure 9	Dental Sealants by Medicaid Status and Grade ..... 6.5
Figure 10	Regional Oral Health Coalitions .....6.12
Figure 11	Counties with Dental Schools and Dental Hygiene Programs ..... 7.3
Figure 12	Preventive Dental Care in Past 12 months (2003) among Children and Adolescents by Race/Ethnicity ..... 7.4
Figure 13	Preventive Dental Care in Past 12 months (2003) among Children and Adolescents by Sex ..... 7.5



## EXECUTIVE SUMMARY

*Oral Health in Texas 2008* represents the most comprehensive source of information regarding the oral health status of Texans. This document presents a “snapshot” of oral health and the distribution of oral health problems among Texas residents. The descriptions of oral health problems, their causes, and possible solutions are based on the most current data available from national, state, and community level surveys. The Oral Health Program (OHP) at the Texas Department of State Health Services (DSHS) collects, organizes, and analyzes information about oral health behavior and determines trends from these data.

As a result of the release of three important documents; *Oral Health in America: A Report of the Surgeon General* (2000); *A National Call to Action to Promote Oral Health* (2003); and *Office of the Inspector General Report: Children’s Dental Services Under Medicaid – Access and Utilization* (1996), public awareness of oral health increased. These reports show that prevention, early detection, and treatment of oral diseases can greatly improve not only the oral health, but also the overall health of children and adults. Oral health problems are mostly preventable, but prevention requires early identification of the health needs of a population and timely access to health care.

*Healthy People 2010 (HP 2010)* presents a comprehensive, nationwide health promotion and disease prevention agenda (U.S. DHHS 2000b) and serves as the roadmap to improve the health of all people in the United States within the first decade of the 21st century. The *HP 2010* oral health objectives were established as benchmarks of oral health for all states and territories by Health and Human Service (HHS) agencies, including the Centers for Disease Control and Prevention (CDC), Health Resources and Services Administration (HRSA), Indian Health Service (IHS), and the National Institutes of Health (NIH). These *HP 2010* oral health objectives provide the framework for this document.



*Oral Health in Texas* has three purposes. First, the intent is to inform readers on the progress Texas has made in meeting the objectives set by *HP 2010*. Second, the report represents a discussion of the burden of oral disease and the implication for socioeconomic resources and services in Texas. Finally, an expanded discussion of policy implications is presented. Findings of this report include:

- The most recently available statewide data (August 2006) indicate that Texas is making progress toward meeting *HP 2010* targets among children and adolescents for preventive care, dental sealants, and prevalence of tooth decay.
- Oral cancer is declining in Texas. Oral cancer represents about 2.4 percent of the cancer cases diagnosed annually and is attributed to 1.6 percent of cancer-related deaths (Texas Cancer Registry 2008).
- Black men in Texas are more likely than any other group to develop oral cancer and are much more likely to die from it (Texas Cancer Registry 2008).
- Females and minority populations in Texas experience greater tooth loss than males or whites (TX BRFSS 2002-2006).



## INTRODUCTION

---

Oral health refers to the health of the entire mouth: the teeth, gums, hard and soft palates, linings of the mouth and throat, tongue, lips, salivary glands, chewing muscles, and upper and lower jaws. A growing body of research shows that infections in the mouth, such as periodontal disease, can increase the risk of heart disease (Beck et al. 1998). Periodontal disease has been associated with pre-term delivery (Scannapieco et al. 2003) and complicates the control of blood sugar for people with diabetes (Taylor 2001). Changes in the mouth often serve as the first indicator of problems elsewhere in the body. Infectious diseases, immune disorders, nutritional deficiencies, and cancer often first reveal themselves by changes in the mouth.

Good oral health means more than being free of tooth decay and gum disease. It also means being free of chronic oral pain conditions, oral cancer, birth defects such as cleft lip and palate, and other conditions that affect the mouth and throat. Good oral health includes the ability to carry on the most basic human functions such as chewing and swallowing and perform basic interpersonal communication through speaking, smiling, kissing, and singing. The impact that poor oral health can have on a person's physical, mental, economic, and social health establishes it as an important target for public health concern.

The following is a comprehensive report of the oral health of Texas residents. It contains the most current information available on the oral disease burden in Texas. Populations at highest risk for oral health problems are identified; strategies to prevent poor oral health and to improve access to dental care are discussed; and, when possible, comparisons to the national data regarding the prevalence and incidence rates of oral health problems and oral risk behaviors are made. When appropriate, comparisons are made to the prevalence and incidence rates as outlined by the *HP 2010* goals. For some conditions, only national data were available at the time this report was prepared.

### *Public Health in Texas*

Texas covers a large land area (267,277 square miles) with a very diverse topography. More than 23.5 million people live in Texas (U.S. Census Bureau 2006b). There are many heavily populated urban areas throughout Texas. Dallas, Houston, and San Antonio are among the nation's ten largest cities. However, there are also many sparsely populated and rural areas.

Expanding access to oral care remains a challenging public health issue. The physical distance to dental care facilities/professionals means that many people who reside in the remote areas of Texas face challenges in accessing oral health care. The decreasing numbers of practicing dentists and limited dental specialists, especially in the semi-rural and rural areas of the state, put residents at greater risk for poor oral health. Differences in languages, cultural norms, and expectations shape health provider/patient interaction, communication, and understanding of symptoms, diagnosis, and treatment (Kelly et al. 2005; Hilton et al. 2007).

### *Oral Health in Texas*

The causes and effects of poor oral health and the burden of oral disease are sometimes difficult to disentangle from the personal and social repercussions. Economics, policies, and other factors may affect health outcomes much more than demographics. The lack of understanding of the relationship between untreated oral disease and the overall health of individuals contributes to the oral health status of Texans.

Disparities exist by race/ethnicity and sex in oral health status and access to quality oral health care. The interplay of race/ethnicity with historical discriminatory practices, socioeconomic conditions, and other differences reveals itself in the oral health status of populations and the services they receive. Many health disparities that have been associated with race or ethnicity may, in fact, be due to differences in social class (Murdock et al. 2002). Therefore, race/ethnicity (and many times sex) could be used as indicators of socioeconomic differences in oral health.

When appropriate and when data permit, key oral health indicators are analyzed by socioeconomic status. When these data are not appropriate or available, the analysis of disparities in oral health and the burden of oral disease among Texans are stratified by race/ethnicity and sex.<sup>1</sup>

This document raises public awareness, supports ongoing surveillance efforts, and guides oral disease prevention and intervention efforts related to oral health. Dental professionals and policymakers can use this document and the lessons learned to help enhance the quality of oral health care for Texas residents.

<sup>1</sup> In the discussion of race/ethnicity and culture or other discussions of demography, there is an attempt to remain consistent in the terminology and to source materials. However, the standardization of the terminology was a difficult task as several data sources contribute to the discussion of population shifts and epidemiological analyses. In addition, there is no agreement from civil rights or advocacy groups, federal policies, or state guidelines regarding a uniform term (Murdock et al. 2002). As the Office of the State Demographer suggests, the comparisons between data sources are difficult due to the variability in response categories for race/ethnic identification (Murdock et al. 2002). For example, the 2000 Census allowed for the “Multiple-race” identification; however, it is not clear if this category includes the “Other” racial/ethnic response category of previous surveys. Time and resources restricted comprehensive discussion of oral health for all possible combinations of racial/ethnic groups, age range, or sex-specific issues. However, oral health conditions that are found to be particularly prevalent among certain populations are discussed.

## NATIONAL *and* STATE OBJECTIVES *on* ORAL HEALTH

### *Oral Health in America*

The U.S. Surgeon General's report on oral health (*Oral Health in America: A Report of the Surgeon General*, U.S. DHHS 2000a) served as a wake-up call to policymakers, civic leaders, private industry, health professionals, the media, and the public. The report found a lack of public awareness about the importance of oral health and highlighted the existing economic and racial disparities. Specifically, the report showed that disadvantaged and minority children are at the greatest risk for severe medical complications because of poor oral health care. *Oral Health in America: A Report of the Surgeon General* alerted Americans to the importance of oral health in their daily lives (U.S. DHHS 2000a). The report was issued with the intention of motivating policymakers, civic leaders, private industry, health professionals, the media, and the public to affirm that:

*"No one should suffer from oral diseases or conditions that can be effectively prevented and treated. No schoolchild should suffer the stigma of craniofacial birth defects nor be found unable to concentrate because of the pain of untreated oral infections. No rural inhabitant, no homebound adult, no inner-city dweller should experience poor oral health because of barriers to access to care and shortages of resources and personnel."*

—(U.S. Department of Health and Human Services 2003).

The Surgeon General's report serves as a guide to oral health promotion, disease prevention, and disease management by identifying needs and opportunities that exist to enhance oral health. The report discussed several barriers that hinder the ability of some Americans to attain optimal oral health. The Surgeon General noted that despite the number of technological advancements that have been made in the detection and treatment of oral health related diseases, health disparities persist, and access to oral health care remains problematic for some subpopulations.

Five action areas were identified in the report:

- Change perceptions of oral health care;
- Overcome barriers to care by replicating effective programs and proven efforts;
- Build the science base and accelerate science transfer;
- Increase oral health workforce diversity, capacity and flexibility; and
- Increase collaborations.

The report's message was that oral health is essential to general health and well-being and that good oral health can be achieved. Improving oral health cannot be accomplished by any single agency. A successful execution of a comprehensive oral health plan requires partnerships that unite private and public groups focused on common goals.

### *Healthy People 2010*

*Healthy People 2010* (HP 2010) is a comprehensive, nationwide health promotion and disease prevention agenda (U.S. DHHS 2000b). It serves as the roadmap to improve the health of all people in the United States within the first decade of the 21st century. Included are objectives for key structures, processes, and outcomes related to improving oral health. These objectives represent the ideas and expertise of a diverse range of individuals and organizations concerned about the nation's oral health. National objectives for oral health – such as those in *HP 2010* – provide measurable targets for the nation, but most core public health functions of assessment, assurance, and policy development occur at the state level. The institution responsible for these public health functions in Texas is the Department of State Health Services' (DSHS) Oral Health Program (OHP).

Achieving *HP 2010* objectives requires creative, new, and collaborative approaches. Success involves approaches that are supported by communities and have scientific rationale. DSHS continues to rely on multiple strategies to evaluate and document the state's program accomplishments. The evaluation plan will rely on a set of measurable and achievable objectives on key indicators of the oral disease burden, oral health promotion, and oral disease prevention. Where possible, OHP data that are relevant to *HP 2010* oral health indicators are presented in this report.

Texas is reaching or has surpassed several of the *HP 2010* objectives. For example, an *HP 2010* objective is the reduction of the oral cancer death rate to 2.7 per 100,000 person years. In Texas, the mortality rate for oral cavity and pharynx cancer in 2003 was 2.6 per 100,000 person years (Texas Cancer

Registry 2003), just below the *HP 2010* objective of a rate of 2.7 per 100,000 person years. Access to fluoridated water systems in Texas is slightly higher than the national average with 78 percent of Texans having access while the national average is 62 percent (WFRS 2007).

In other areas, the oral health of Texans has yet to reach the *HP 2010* objectives. Targets for the national *HP 2010* oral health objectives for the nation and the status of each indicator for the United States and for Texas are summarized in Table 1.

### *Call to Action*

As a result of the Surgeon General's report, a broad coalition of public and private organizations and individuals collaborated in the preparation of the National Call to Action to Promote Oral Health (U.S. DHHS 2003). The goals in the Call to Action report are an extension of the set of national indicators developed in *HP 2010* oral health objectives. The main goal of the Call to Action was "to advance the general health and well-being of all Americans by creating critical partnerships at all levels of society to engage in programs to promote oral health and prevent disease." Additional goals of the Call to Action were:

- To promote oral health;
- To improve quality of life; and
- To eliminate oral health disparities.

### *DSHS Oral Health Program*

DSHS OHP has responded to the Call to Action by participating in the development of a collaborative oral health plan, the Texas Oral Health Coalition, an oral health surveillance system, and the development of a comprehensive evaluation plan.

Table 1. *Healthy People 2010* Oral Health Objectives: Targets and Progress: U.S. and Texas

<i>Healthy People 2010</i> Objectives	Target (%)	U.S. <sup>a</sup>	Texas <sup>b</sup>
21-1 Dental caries experience			
a) Young children, 2–4 years	≤11%	23%	45%
b) Children, 6–8 years	≤42%	50%	68%
c) Adolescents, 15 years	≤51%	59%	N/A
21-2) Untreated caries			
a) Young children, 2–4 years	≤ 9%	20%	29%
b) Children, 6–8 years	≤21%	26%	44%
c) Adolescents, 15 years	≤15%	16%	N/A
d) Adults, 35–44 years	≤15%	26%	N/A
21-3) No permanent tooth loss: adults 35–44 years	≥42%	39%	39%
21-4) Complete tooth loss: adults 65–74 years	≤20%	26%	17%
21-5) Periodontal diseases: adults 35–44 years			
a) Gingivitis	≤41%	48%	N/A
b) Destructive periodontal diseases	≤14%	20%	N/A
3-6) Oral/pharyngeal cancer death rate per 100,000 (age-adjusted)	≤2.7	3.0	2.6
21-6) Oral/pharyngeal cancer detection at earliest stages	≥50%	35%	29%
21-7) Annual examinations for oral/pharyngeal cancers	≥20%	13%	N/A
21-8) Dental sealants			
a) Children, aged 8 years (1st molars)	≥50%	28%	20%
b) Adolescents, aged 14 years (1st and 2nd molars)	≥50%	14%	N/A
21-9) Community water fluoridation (% of population served)	≥75%	62%	78%
21-10) Use of oral health-care system (% of population ≥ 2 years with dental care visit in past year)	≥56%	43%	33%
21-11) Use of oral health-care system by adult residents in long-term care facilities	≥25%	19%	N/A
21-12) Preventive dental service utilization (in past 12 months) by low-income youth (0–18 years)	≥57%	31%	32%
21-14) Community-based health centers and local health departments with oral health components	≥75%	61%	N/A
21-15) System for recording and referring infants and children with cleft lip and cleft palate	50 states and DC	23 states	N/A
21-16) Oral health surveillance system	50 states and DC	N/A	N/A

a Data sources: *Healthy People 2010*. U.S. Department of Health and Human Services. Available at: [www.healthypeople.gov/Document/HTML/Volume2/21Oral.htm#\\_Toc489700405](http://www.healthypeople.gov/Document/HTML/Volume2/21Oral.htm#_Toc489700405); National Health and Nutrition Examination Survey (NHANES), CDC, NCHS 1999–2000: Objectives 21-1, 21-2, 21-3, 21-4, & 21-8; National Health Interview Survey (NHIS), CDC, NCHS: 21-5a 1988–1994, 21-5b 2000, & 21-7 1998; Surveillance, Epidemiology, and End Results (SEER) 12 Registry, NIH, NCI 1996–2000: Objective 21-6 1996–2000; National Vital Statistics System (NVSS), CDC, NCHS: Objectives 3-6 1998; CDC Fluoridation Census, CDC, NCCDPHP: Objectives 21-9 2002; Medical Expenditure Panel Survey (MEPS), AHRQ 2002: Objectives 21-10 & 21-12. Data is for adults 18 years or older. National Nursing Home Survey (NNHS), CDC, NCHS: Objectives 21-11 1997; HRSA, Bureau of Primary Health Care (BPHC): Objectives 21-14 2002; Survey of State Dental Directors, Illinois State Health Department: Objectives 21-15 1997b.

b Data sources: 2004–2006 Basic Screening Survey (BSS) of Children at Texas Public Schools: Objectives 21-1b, 21-2b, & 21-8a 2006–2007; BSS of pre-school/pre-kindergarten age children at Head Start sites: Objectives 21-1a & 21-2a 2007; Texas Water Fluoridation Reporting System (WFRS) annual report: Objectives 21-9; Behavioral Risk Factor Surveillance System (BRFSS) 2006: Objectives 21-3 & 21-10; DSHS Cancer Registry: Objectives 21-4, 21-6, 3-6 2005; MEPS, AHRQ 2005: Objectives 21-10 & 21-12.

The *Collaborative Oral Health Plan in Texas* provides guidance for enhancing oral health. Several overarching points surround the strategies that are outlined in the plan. State and local systems should work collaboratively to make sustained improvements in oral health for children and adults in Texas. Multidisciplinary collaboration and coordination between systems – including medical, dental, and mental health; social services, academia, nonprofit and professional organizations; and government at the state and local levels – are essential for progress. Leadership at the state and local levels is critical to advocate for quality assurance, policy changes, and enhanced human and financial resources throughout the oral health system (Brown & Steffensen 2005).

Priorities of the DSHS OHP include identifying areas of the state in greatest need and utilizing regional staff to provide targeted preventive dental services. Through August 2006, dental screenings were provided to 17,344 schoolchildren and 5,836 (33 percent) received dental sealants. Screenings were also done on 3,698 Head Start students and 3,620 (97.9 percent) received fluoride varnish (Texas Basic Screening Survey, 2004-2006).

The DSHS OHP recognizes the necessity of a surveillance system to monitor Texans' oral health status. A priority of the DSHS OHP is the establishment and implementation of scientifically based protocols and methodologies to obtain data on the oral health status of Texans in order to most appropriately affect policy and the provision of services.

In light of the disparities that exist in oral health, another priority of the DSHS OHP is to focus resources on efforts to address the expansion of the dental workforce through increased infrastructure, partnering opportunities, and increased utilization of dental services in areas of the state where access is less of an issue, yet utilization remains low.

A final priority of the OHP is to enhance efforts to increase the number of communities with optimal levels of fluoridation in their water supplies. Several communities throughout Texas do not benefit from optimal levels of fluoride. Nationally, forty percent of children do not have access to fluoridated water (AAPD 2008). *HP 2010* recommends an increase in the proportion of the population served by optimally fluoridated water to 75 percent. A CDC study found that for communities with 20,000+ residents, every \$1 invested in community water systems with fluoridation yields \$38 in savings from fewer cavities treated (Griffin et al. 2001).



## STATE PROFILE

The demographics of Texas have changed dramatically since its settlement over 150 years ago. Over the past century, Texas has moved from being an entirely rural and sparsely populated state, to being the second most populated state in the United States. Texas had an estimated population of over 23 million people in 2006, including three of the ten largest cities in the nation (U.S. Bureau of the Census 2006b). The dramatic increase in population over the past century has posed challenges in providing public services and ensuring the public welfare.

### Demographics

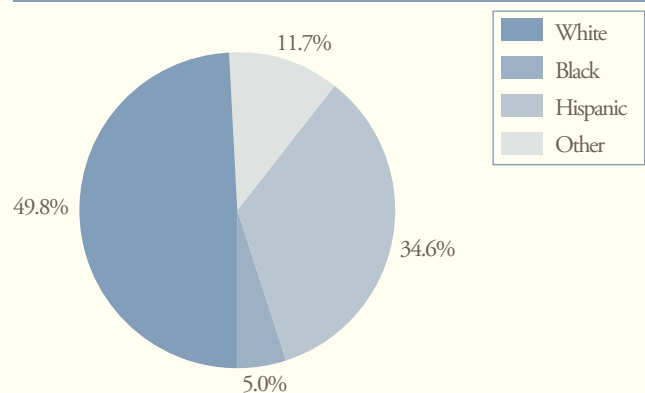
#### Race/Ethnicity

The racial/ethnic makeup of Texas residents is diverse. Population projections from the Office of the State Demographer predict that the white population in Texas is declining. By 2006, the white population accounted for less than 50 percent of the population in Texas, as shown in Figure 1. By 2040, the majority of the people living in Texas will be Hispanic (TSDC 2006).

#### Age

The 2006 data from the U.S. Census Bureau shows that approximately 27.6 percent of Texans are under the age of 18, and approximately ten percent of Texans are aged 65 and older, as shown in Figure 2 on the next page. Substantial

FIGURE 1: POPULATION BY RACE/ETHNICITY  
TEXAS, 2006



Source: Texas State Data Center and Office of the State Demographer 2006.

growth among the over-65 age group in Texas and the United States is expected over the next several decades due to the aging of the “baby boomer” generation. People in the 25–45 age group make up 32 percent of the total number of Texas residents (TSDC 2006).

By 2040, the median age of Texans will rise from 38.1 to 38.6 years. Texans ages 65 years or older are expected to account for approximately 16 percent of the population by 2040, compared to 9.9 percent in 2000. This percentage means that by 2040, the number of people 65 years or older could be as high as 8.2 million: a 295 percent increase from 2000 (TSDC 2006).



The white population will have the highest median age according to these projections. In 2040, the median age is projected to be between 45.6 and 46.2 years for whites and between 39.8 and 40.2 years for blacks. The Hispanic population will have the lowest median age at between 34.0 and 35.2 years (TSDC 2006).

#### *Urban and Rural Populations*

Of the 254 counties in Texas, the six most-populated counties are: (in alphabetical order) Bexar, Dallas, Harris, Hidalgo, Tarrant, and Travis. Fifty percent of Texas residents live in these six counties. Figure 3 maps the population density of the state including where these six counties are located. Although the largest concentration of residents is located in these six counties, vast, sparsely populated areas separate these counties.

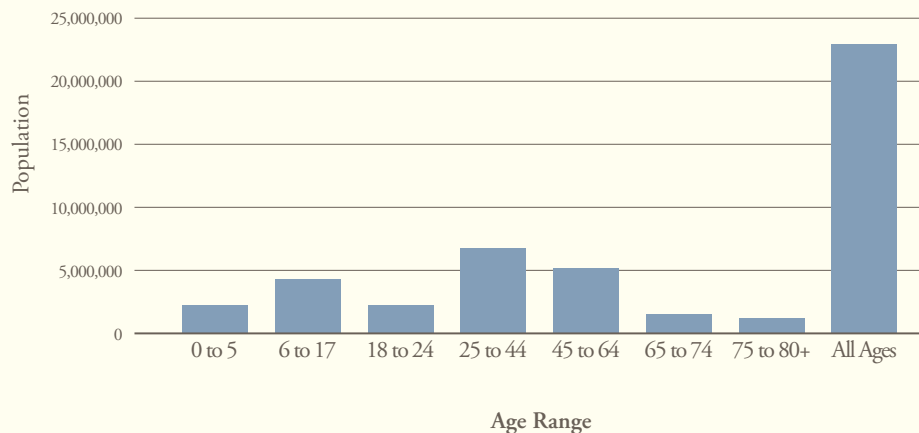
According to the Texas State Data Center (TSDC) and the Office of the State Demographer, by the year 2010, 25 million people will be living in Texas.



By 2040, more than 51.7 million people will be living in Texas (TSDC 2006).

Population projections are useful in explaining the challenges of population growth and rapid changes

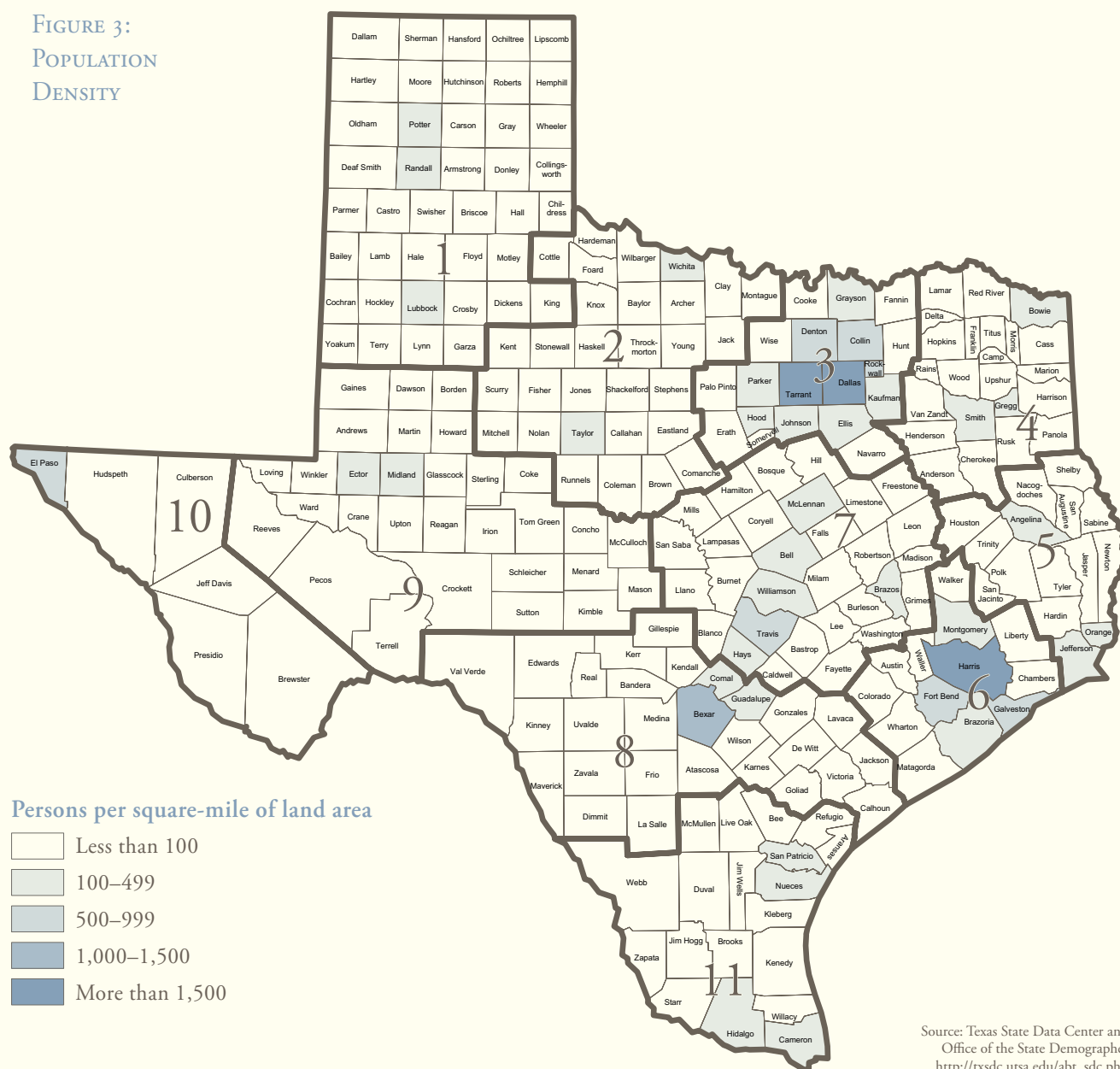
FIGURE 2: POPULATION BY AGE  
TEXAS, 2006



Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement 2006.



FIGURE 3:  
POPULATION  
DENSITY



in the composition of the population of Texas (TSDC 2006). However, populations can mobilize and migrate in unforeseen ways. The Office of the State Demographer cautions that these projections should be used with care due to inherent limitations. While the magnitude of population growth remains speculative, experts do agree that the population will

grow. The demand for housing, education, welfare, and employment services changes in direct proportion to population characteristics (Murdock et al. 2002). If the socioeconomic differences and the disparities that exist between groups do not change and the population continues to expand, the state's public health system will continue to be extremely overburdened.



### *Access to Care*

Individuals need to be in good health and have good oral health to compete and contribute in a future of economic challenges and change. In 1986, the Texas Legislature mandated that DSHS implement a comprehensive oral health services program targeted for eligible and indigent Texas residents. Under auspices of the Texas Oral Health Improvement (OHI) Act, the following services applied:

- Oral health treatment services;
- Oral disease prevention;
- Oral health education and promotion; and
- Facilitation of access to oral health services.

The OHI Act also stated that DSHS may conduct field research, collect data, and prepare statistical and other reports relating to the need for and the availability of oral health services (Texas Administrative Code 1986).

A prominent challenge to fulfilling the goals of the OHI Act is agreeing upon a definition of access to health care. Measurement of access to oral health care may include a count of the number of dental providers in each county. However, other factors impact access to dental care services. The hours and location of services, patient eligibility criteria, cultural and language competency of health professionals, cost of services, and/or the presence of health insurance coverage and how services are offered are all interrelated and affect access to services.

The oral health of children has improved over the past few decades, and most American children now have access to oral health services. Nonetheless, a significant subset of the population experiences a high level of oral disease, and little progress has been made in reducing cavities among children living in poverty. The National Survey of Children's Health (NSCH) revealed that 14 percent of Texas children had never seen a dentist (NSCH 2003). The most advanced cases of oral disease are found primarily among children living in poverty, some racial/ethnic minority populations, children with disabilities, and children infected with HIV (U.S. DHHS 2000a). Access to preventive and therapeutic services is most important for these children.

## THE BURDEN *of* ORAL DISEASES

### *Prevalence of Oral Disease and Unmet Need in Oral Health*

#### *Oral Health in Children*

Tooth decay (dental caries) is the most common chronic childhood disease. Acids produced by bacteria on the teeth cause mineral depletion from the enamel and dentin (the hard substances of teeth). Dental caries can have serious consequences, including the loss of tooth structure, inadequate tooth function, unsightly appearance, pain, infection, and tooth loss. If left untreated, the pain and infection of tooth decay can lead to problems in eating, speaking, and learning. Annually, an estimated 51 million school hours across the nation are lost because of dental-related illness (U.S. DHHS 2000a).

Tooth decay is five times more common than asthma and seven times more common than hay fever (U.S. DHHS 2003). The Surgeon General described the emergent reality of poor oral health for children as follows:

*“The daily reality for children with untreated oral disease is often persistent pain, inability to eat comfortably or chew well, embarrassment at discolored and damaged teeth, and distraction from play and learning.”*

– (Finn & Wolpin 2005; U.S. DHHS 2000).

The prevalence of tooth decay is not uniformly distributed in the United States or in Texas. Some groups of children, such as those from low-income or minority families, are more likely to experience the condition (Mouradian et al. 2000). Past research consistently shows an inverse relationship between parents’ socioeconomic status and children’s tooth decay (Reisine & Psoter 2001). Children from low-income and minority families often have poorer oral health outcomes, fewer dental visits, and fewer protective sealants. Furthermore, while water fluoridation is effective for preventing caries, only 62 percent of the public water supplies in the United States are fluoridated (Mouradian et al. 2000).

Table 2 shows percentages of children and adolescents living in Texas and the United States who are reported to have teeth in excellent or very good condition. In 2003, the proportion of Texas children reported to have teeth in excellent or very good condition was lower than the national average overall and also lower within all age, sex, and racial/ethnic subgroups. Within different levels of socioeconomic status (SES), which was proxied by percent of the federal poverty level (FPL), Texas also had lower proportions of children with teeth in excellent or very good condition compared to the United States; however, at the highest SES level there was no difference. Compared to

Table 2. Condition of Teeth and Preventive Dental Care: U.S and Texas

	Condition of Teeth: Excellent or very good		Preventive Dental Care: ≥1 Preventive visit within past year (2003) <sup>a</sup>	
	U.S. %	Texas %	U.S. %	Texas %
All children 0–17	64.3	57.6	67.6	61.6
Age (years)				
1–5	75.8	70.7	46.8	48.4
6–11	61.7	50.9	83.4	74.8
12–17	67.4	61.2	79.4	69.7
Socioeconomic status				
0–99% Federal poverty level	45.4	40.7	54.1	56.0
100–199% Federal poverty level	56.5	48.9	61.6	52.6
200–399% Federal poverty level	71.2	66.7	73.0	67.4
≥400% Federal poverty level	78.1	78.3	77.8	73.3
Race/ethnicity				
White	69.3	65.4	70.6	64.4
Black	57.4	53.4	62.6	64.9

a Survey questions that solicit information within the past year or 30 days are from the time when the survey was administered to each particular respondent.  
Source: National Survey of Children's Health 2003. Both samples are weighted.

national averages, Texas had higher proportions of both male and female children ages one to five with very good/excellent dental health. Table 2 also shows proportions of children and adolescents living in Texas and the United States who have received preventive dental care during the past year (2003)<sup>a</sup>. Percentages for Texas children were generally lower than national averages except among black children, children ages one-to-five and children at 0–99 percent FPL; however, some of these differences are very small and may not be statistically significant.

The prevalence of tooth decay in children is measured by assessing caries experience. Caries experience is defined by the presence of treated decay (if the child has ever had decay and now has fillings) or untreated decay (active unfilled cavities). The most recent data for six-to-eight-year-old children in Texas and the nation (for selected demographic groups) are summarized in Table 3. As shown here, prevalence of the caries experience, including untreated decay, is higher among six-to-eight-year-old

children in Texas compared to six-to-eight-year-old children in the United States.

Table 3. Dental Caries Experience and Untreated Dental Decay Among 6- to 8-year-old Children: U.S. and Texas

	Caries Experience		Untreated Decay	
	U.S. <sup>b</sup> (%)	Texas <sup>c</sup> (%)	U.S. <sup>b</sup> (%)	Texas <sup>c</sup> (%)
TOTAL	50	68	26	44
Race/Ethnicity				
White	46	61	21	39
Black	56	67	39	44
Hispanic	69	72	42	47
Other	N/A	63	N/A	40
Sex				
Male	50	68	28	45
Female	49	68	24	44
Medicaid				
Yes	N/A	70	N/A	38
No	N/A	67	N/A	48

b Data source: *Healthy People 2010*, Progress Review 2000. U.S. Department of Health and Human Services. Available at [www.cdc.gov/nchs/ppt/hpdata2010/focus\\_areas/fa21.xls](http://www.cdc.gov/nchs/ppt/hpdata2010/focus_areas/fa21.xls)

c Data source: Basic Screening Survey, Texas Department of State Health Services, Oral Health Program 2004–2006.

*Birth Defects: Cleft Lip and Palate*

Birth defects in the form of cleft lip or cleft palate also represent a significant burden for public health efforts targeted at oral health. From 1999–2004 in Texas, there were 1,262 cases of cleft palate detected among all live births occurring during that time, for a prevalence rate of 5.71 per 10,000 live births. There were 2,399 cases of cleft lip during this time for a prevalence rate of 10.86 per 10,000 live births. Race variations exist among families with children born with a cleft lip (with or without a cleft palate). From 1999–2004, the prevalence rate for cleft lip among children born to Hispanic women was 11.52 per 10,000 live births, compared to 10.84 per 10,000 live births for children born to white women and 7.65 per 10,000 live births among children born to black women (Texas Birth Defects Registry 2008).

Infants born with a cleft palate are unable to suckle, and therefore are unable to feed. These children are at extremely high risk for starvation. Children with facial deformities are at an elevated risk for a variety of adverse social/psychological outcomes, including behavior problems, poor self-concept, and parent-child relationship difficulties (Collett et al. 2006; Houston & Bull 1994). In addition, research has shown a relationship between craniofacial disfigurement severity and incidence and frequency of victimization by peers at school (Carroll & Shute 2005). Reconstructive surgery is required to correct cleft lip, cleft palate, and other facial irregularities.

*Oral Health in Adults*

While tooth decay among children and adolescents is a prominent concern because it sets the stage for a lifetime of oral health problems, dental problems in adults are equally problematic. According to

*Oral Health in America: A Report of the Surgeon*

*General*, most adults show signs of periodontal or gingival diseases. Severe periodontal disease affects about 14 percent of adults ages 45–54 years. Not only do adults experience dental caries, but also a substantial proportion of this disease is untreated at any point in time. A little less than two-thirds of adults report having visited a dentist in the past 12 months (1997)<sup>a</sup>. Those with incomes at or above the poverty level are twice as likely to report a dental visit in the past 12 months as those who are below the poverty level (1993)<sup>a</sup>. One explanation for infrequent dental visits is the lack of dental insurance. The number of individuals who lack dental insurance is over 2.5 times the number of those who lack medical insurance (U.S. DHHS 2000a).

*Tooth Loss*

The most common reasons for tooth loss in adults are tooth decay and gum disease. Tooth loss can also result from infection, unintentional injury, and head and neck cancer treatment. Certain orthodontic and prosthetic therapies may require the removal of teeth as well. Social functioning is restricted because tooth loss can reduce the ability to form sounds and speak clearly so as to be understood. Oral health problems can limit a person's food choices and lead to poor nutrition (Sahyoun 2004). With adequate personal and professional care in addition to population-based prevention, individuals can possibly keep a full set of their teeth throughout life. However, the reality is that tooth loss increases with age. Tooth loss is heavily influenced by smoking, specifically at a young age. A combination of plaque and smoking is a strong predictor of tooth loss (Holm 1994).

<sup>a</sup> Survey questions that solicit information within the past year or 30 days are from the time when the survey was administered to each particular respondent.

Data from Behavioral Risk Factor Surveillance System (BRFSS) provides information on demographic variations in tooth loss. This survey is conducted by phone with a sample of non-institutionalized adults in Texas. The purpose of the BRFSS is to collect data on a variety of health issues as reported by survey participants. Since 2002, the BRFSS has collected oral health data every other year. Findings show that females and minority populations suffered more from tooth loss than males or whites.

Figure 4 shows that from 2002 to 2006, the percentage of participants who reported having one or more teeth removed had declined over this five year period. However, the percentage of females who reported removal of one or more teeth was higher than percentages among males at each time point. Proportions of females declined from approximately 48.2 percent in 2002 to 44.5 percent in 2006. Proportions of males declined from approximately 43.3 percent in 2002 to 37.8 percent in 2006.

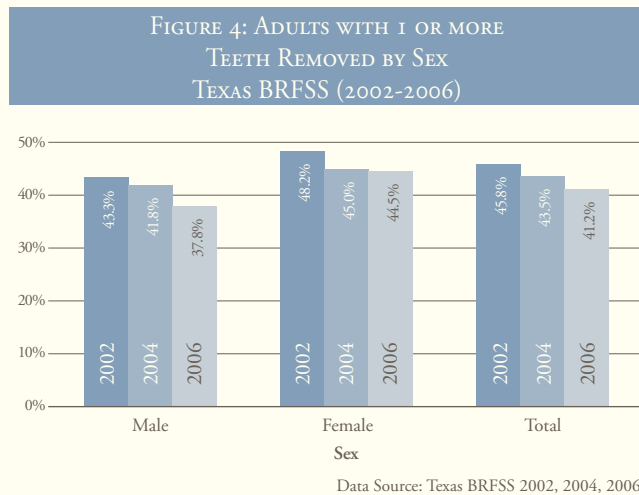
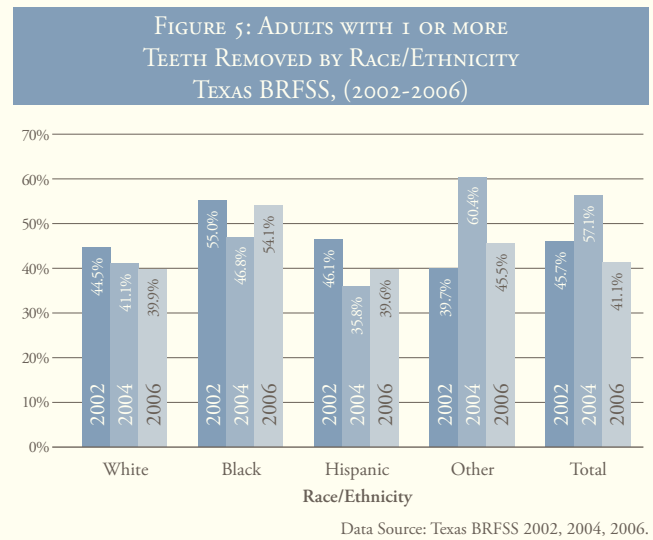


Figure 5 presents the prevalence of tooth extractions in Texas by race/ethnicity. Between 2002 and 2006, tooth extractions among blacks and Hispanics decreased from 55 percent to 54 percent and 46 percent to 39.6 percent,

respectively. Despite these decreases, in general, extractions reported for Hispanic and black respondents were slightly higher than that of whites for the same period.



### Periodontal Diseases

An estimated 80 percent of American adults currently have some form of gum disease (U.S. DHHS 2006). A number of conditions affect the gums. A particularly common condition is gingivitis. This disease is usually the result of poor oral hygiene; however, it can also be the result of other conditions, such as diabetes. Gingivitis is characterized by red, swollen, and bleeding gum tissue closest to the teeth. The condition is usually preventable with good oral hygiene and reversible with proper treatment and care. Personal care to prevent gingivitis means the daily removal of dental plaque by brushing and flossing. Without consistent personal prevention efforts, gingivitis can progress to more serious and destructive diseases, such as periodontitis.

Symptoms of periodontitis include the loss of the tissue and bone that support the teeth. People with periodontal diseases are particularly vulnerable to



tooth loss unless appropriate treatment is received. Periodontitis is a leading cause of bleeding, pain, infection, loose teeth, and tooth loss among adults (Burt & Eklund 1999). Smoking can promote gingivitis and has been linked to cases of adult periodontitis (Tomar & Asma 2000).

### *Oral Cancer*

In 2004, an estimated 28,260 new cases of oral cancer were reported in the United States. Worldwide the problem is far greater, with an annual incidence of more than 481,000 new cases per year. The average age at diagnosis is between 65 and 74 years of age (Ries et al. 2004). Between 1975 and 2001, rates of oral cancer detection have been declining for both blacks and whites.

The evidence is well established that tobacco use is a prominent cause of oral cancer. All nicotine delivery methods, including smokeless tobacco and cigars, have been linked to cancers throughout the body (Shanks & Burns 1998; Christen & McDonald et al. 1991). Smoking, chewing, dipping, or snuffing tobacco have been identified as determinants of oral cancers including cancers of the mouth, throat, larynx, and esophagus (U.S. DHHS 1986; IARC 2005). The combination of smoking and alcohol consumption has been linked to more than 75 percent of oral cancers (Blot et al. 1988). Dietary factors – particularly low consumption of fruit – and some types of viral infections also have been implicated as risk factors for oral cancer (McLaughlin et al. 1998; De Stefani et al. 1999; Levi 1999; Morse et al. 2000; Phelan 2003; Herrero 2003). Radiation from sun exposure is a risk factor for lip cancer (Silverman et al. 1998).

The earlier oral cancer is diagnosed, the better the prognosis. Therefore, several *HP 2010* objectives



specifically address early detection of oral cancer.

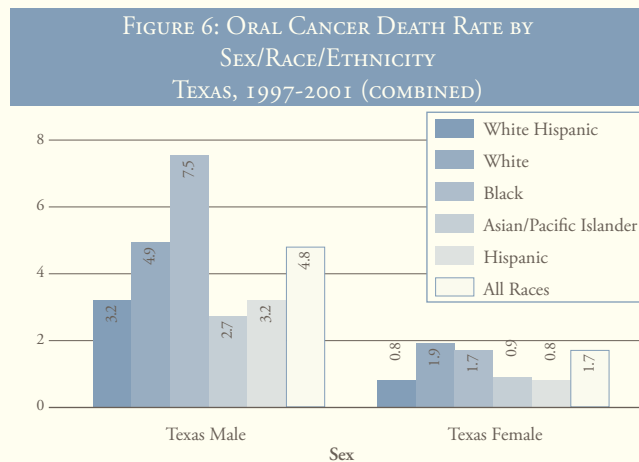
Objective 21-6 is to “Increase the proportion of oral and pharyngeal cancers detected at the earliest stage.”

Objective 21-7 is to “Increase the proportion of adults who, in the past 12 months, report having had an examination to detect oral and pharyngeal cancer” (U.S. DHHS 2000b). Data show that males and minorities in the United States have lower proportions of early detection (stage 1, localized) (U.S. DHHS 2004b). Unfortunately, the majority of oral cancers are found as late-stage cancers, accounting for the high death rate of about 50 percent at five years from diagnosis (Oral Cancer Foundation 2008).

In Texas, an estimated 14,884 cases of oral cavity and pharyngeal cancer were diagnosed and reported from 1995 to 2002. Oral cancer represents about 2.4 percent of the cancer cases diagnosed annually and is attributed to 1.6 percent of all cancer-related deaths (Texas Cancer Registry 2008).

Figure 6 compares the oral cancer death rate in Texans

by race and sex. The figure shows that men have higher oral cancer death rates than women regardless of race/ethnicity. Black males have the highest rate at 7.5 per 100,000 persons (Texas Cancer Registry). Asian/Pacific Islander males have the lowest rate of all males, followed by Hispanics. In Texas, the rates for white males are similar to Hispanic males. Texas females are slightly below the national oral cancer death rate. white Non-Hispanic, Asian, Pacific Islander, and Hispanic women have very similar rates in Texas.



\* Rates are per 100,000 and age-adjusted to the 2000 U.S. Std Population. Prepared by the Texas Department of State Health Services, Cancer Epidemiology and Surveillance Branch, Texas Cancer Registry. Data Request # 08124, 05/23/2008.

Among men, there is a disparity in the oral cancer death rates by race, with black men having the highest rate in Texas. State efforts to reduce Texans' risks for oral cancers include tobacco control efforts, oral health advocacy, and educational initiatives. These results point to the need for special efforts to target those groups most at risk for dying from oral cancer, including targeted outreach campaigns for black men.

## Disparities

Low-income, minority, and disabled populations, and women often have difficulty accessing dental services, which makes them more likely to develop oral health problems. Poor prevention in these populations often leads to more serious and expensive future health concerns (U.S. DHHS 2000a). An examination of the disparities in oral health between racial/ethnic and other groups is necessary in order to understand the entirety of the problem and the environment in which public health programs must operate. This section will examine the disparities in oral health more closely among different racial/ethnic groups, women, people with disabilities, and those with low incomes.

### Racial and Ethnic Groups

Although the oral health status for the entire nation has improved in some aspects, particular groups still suffer disproportionately from oral health problems. Most oral diseases and conditions are complex and represent the product of interactions between genetic, socioeconomic, behavioral, environmental, and general health influences. An examination of the spread of oral diseases in the United States shows that black, Hispanic, American Indian, and Alaskan Native populations generally have poorer oral health compared to white or Asian populations (Edelstein 2002; Aday & Fortthofer 1992; Franco et al. 1993).

Oral health problems that are disproportionately represented among certain racial/ethnic groups include: dental caries, poor-or-no treatment, and extensive tooth loss. The black population in the United States and in Texas is more likely than any other racial/ethnic group in any age range to suffer from gum diseases, such as gingivitis and periodontitis.





Blacks are also more likely to develop oral or pharyngeal cancer, less likely to have it diagnosed at early stages, and experience a poorer five-year survival rate, as compared to whites. These disparities may be due to the more frequent use of alcohol and tobacco among the black population (Day et al. 1993). Effective programs need to consider racial/ethnic as well as cultural differences in oral health and adapt outreach campaigns accordingly.

#### *Women's Health*

Previous research confirms that certain oral health problems are less prevalent among women than men (Redford 1993; U.S. DHHS 2000b; Franco et al. 1993). Adult females are less likely than adult males, across all age ranges, to suffer from severe periodontal disease. Both black and white females have a substantially lower incidence of oral and pharyngeal cancers compared to males in those same racial/ethnic groups. However, a higher proportion of women have oral/facial pain, including pain from oral sores,

jaw joints, face/cheek, and burning mouth syndrome (Riley & Gilbert 2001). Reducing the prevalence and incidence of oral diseases among women presents a significant public health challenge.

While most oral health issues are not unique to the female population, several factors place women at an increased risk for the development of oral health problems. Among the most prominent of these factors are the fluctuations in levels of estrogen and progesterone associated with puberty and pregnancy. Hormonal medications can exacerbate symptoms of gingivitis and promote the development and progression of periodontal diseases (Steinberg 1999).

Oral health can be compromised during the earliest stages of pregnancy and impact the mother and infant. A growing body of research shows that women with periodontal disease are three to five times more likely to experience pre-term labor compared to women with healthy gums. Women with severe periodontal disease are more likely to have either pre-term labor or premature rupture of membranes, which in turn may lead to low birth weight infants (Davenport et al. 1998). Mothers with good oral health tend to have full-term, normal birth weight infants. Particular attention should be paid to pregnant women who may face poor birth outcomes because of poor oral health.

Researchers have also identified maternal oral health status as a significant determinant of early childhood caries (ECC). Several researchers have proposed that oral bacteria are often transmitted from mother to child. Researchers have provided evidence that the principal bacteria associated with ECC are acquired from the mother sometime after an infant's first set

of teeth begins to emerge (Caufield 1982, 1993, 2000). In addition, infant feeding practices affect the development of ECC. Such practices include prolonged contact (longer than a meal time) with almost any liquid other than water.

Data from the CDC Pregnancy Risk Assessment Monitoring System (PRAMS) – an ongoing state-level, population-based surveillance survey of women’s attitudes, experiences, and behaviors before, during, and after pregnancy – have shown that most mothers do not make a dental visit during pregnancy. Of those who reported having oral health problems, 50 percent did not seek care (Ressler-Maerlender 2005). Some women believe that poor oral health during pregnancy is normal. They may fear certain aspects of dental care during pregnancy. Some women believe that dental treatments may harm them or their fetus(es). PRAMS researchers therefore maintain that if pregnancy modifies perceptions of oral health and dental care,



then it may contribute to women’s avoidance of dental treatment while pregnant (Ressler-Maerlender 2005). The oral health needs of pregnant women present an opportunity for targeted efforts in Texas.

#### *Persons with Disabilities*

Nationally, disabilities affect one in five Americans (Census Brief 1997). The determinants of oral health problems of persons with disabilities are complex. This population presents a special challenge to oral health professionals. The inability to provide personal care and access to professional services contributes to the poor oral health of many people with disabilities.

Several smaller-scale studies show varying rates of poor oral health among people with mental disabilities. Results of these studies show that people with mental illness and/or developmental disabilities compared to the general population have higher rates of periodontal disease. Significantly higher rates of poor oral hygiene and lower rates of diagnosis and treatment contribute to an elevated rate of gum disease among people with disabilities. Limitations in individual comprehension and/or possible physical limitations may inhibit personal prevention practices, such as tooth brushing and flossing or seeking needed services (Burtner & Dicks 1994).

#### *Socioeconomic Disparities*

The probability of tooth decay is highest and the probability of receiving treatment is lowest for adults living below the poverty level. As a result, more people living below the poverty level in America have lost all of their natural teeth compared to those living above the poverty level (U.S. DHHS 2000b). Regardless of age, sex, race/ethnicity, or geographic locale, more

people below the poverty level have periodontitis or serious gum disease than people above the poverty level.

Poverty, education and oral health are all connected. A higher percentage of gum disease has been found in adults with only a high school education (28 percent) as compared to adults who had some college (15 percent). (U.S. DHHS 2000b). In addition, the U.S. Department of Health and Human services showed that 39 percent of persons aged 65 years and older with less than a high school education were without teeth in 1997. For people in the same age group with some college education, the percentage was 13 percent (U.S. DHHS 2000b).

In the United States, 37 percent of children ages two to nine years living below the poverty level have one or more decayed primary (baby) teeth, compared to 17 percent of children in the same age group living above the poverty level. Nationally, 50 percent of low-income children ages two to 11 years have one or more untreated decayed primary teeth, compared with 31 percent of non-low-income children. The association between poverty and poor oral health is ubiquitous across all the states. Adolescents, regardless of sex or racial/ethnic group, living below the poverty level are unlikely to receive treatment for decayed permanent teeth (U.S. DHHS 2000b).

### *Societal Impact*

Oral and craniofacial diseases and conditions compromise the ability to bite, chew, and swallow foods. They limit food selection and thereby contribute to poor nutrition (Sahyoun 2004). These conditions include tooth loss, diminished salivary functions, oral/facial pain conditions such as temporomandibular



joint (TMJ) disorders, alterations in taste, and functional limitations of prosthetic replacements. Oral/facial pain, as a symptom of untreated dental and oral problems and as a condition in and of itself, is a major source of diminished quality of life. Oral pain is associated with sleep deprivation, depression, and multiple adverse psychosocial outcomes (De Leeuw et al. 2005).

Oral diseases have a vast impact on the oral, general, and reproductive health of women, the quality of their lives, and the oral health of their children. While the effects on physical health are substantial, the consequences of oral diseases are also psychological, social, and economic, often resulting in diminished self-image, social isolation, and days lost from work or

school (U.S. DHHS 2000a).

### *Economic Impact*

#### *Direct Costs of Oral Diseases*

Expenditures for dental services in the United States in 2006 were \$91.5 billion, 5.7 percent of the total spent on health care that year (Centers for Medicare and Medicaid Services 2006). Table 4 shows that in 2006, Texas Health Steps (THSteps), Texas's name for the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) Medicaid program for children 0–20 years of age, spent an estimated \$296,876,648 on dental services, of which \$72,797,672 were for orthodontia.

### *Oral Disease and Other Health Conditions*

Many systemic diseases and conditions, including diabetes, HIV infection, and nutritional deficiencies, have oral signs and symptoms. Recent research suggests that inflammation associated with periodontitis may increase the risk of heart disease and stroke, trouble in controlling blood sugar in persons with diabetes, respiratory infection in vulnerable individuals, and pre-term birth (Beck et al. 1998, 2003; Taylor 2001; Jeffcoat et al. 2001). These manifestations may be the initial signs of clinical disease and can serve to inform health-care providers and individuals of the need for further assessment.

**Table 4: Texas DSHS Oral Health Program and Medicaid Expenditures (\$) FY 02 to FY 06**

Program	FY 02	FY 03	FY04	FY05	FY06
Texas DSHS Oral Health Program	2,738,903	2,373,338	906,509	608,327	921,491
Community Water Fluoridation	679,471	336,773	246,526	266,423	141,044
THSteps Dental Medicaid	178,300,531	246,606,848	281,837,577	304,438,923	296,876,648
THSteps Orthodontia Medicaid	14,175,443	21,980,366	34,627,486	53,089,097	72,797,672

\* Recipient months = 1,701

Data source: HHSC System Forecasting and DSHS Budget Revenue April 2007.

#### *Indirect Costs of Oral Diseases*

Oral and craniofacial diseases and their treatment place a burden on society in lost days, and sometimes years, of productive work. Acute dental conditions were responsible for more than 2.4 million days of work- loss and contributed to a range of problems for employed adults, including restricted activity and bed-days. Conditions such as oral and pharyngeal cancers contribute to premature death and can be measured by years of life lost. In the United States in 1996 (the most recent year for which national data are available), schoolchildren missed a total of 1.6 million days of school because of acute dental conditions, which is more than three days for every 100 students (U.S. DHHS 2000a).

## RISK *and* PROTECTIVE FACTORS *Affecting* ORAL DISEASES

Prevention and control programs need to be given high priority in order to minimize the need for curative, restorative, and therapeutic management of oral diseases. This section provides information on the oral health interventions in Texas. Effectiveness of these interventions has been demonstrated through evidence-based research.

The U.S. Preventive Services Task Force combines the best available studies of community water fluoridation and school sealant programs to inform a broad public health audience that these interventions are among the most effective means available to prevent tooth decay (CDC MMWR 2001b). These strategies are particularly useful for reaching entire communities, especially groups at high risk for decay, and they are essential to achieving the national objectives put forth by *HP 2010*.

### *Community Water Fluoridation*

Over the past 60 years, the damage caused by dental decay has been drastically reduced, primarily with fluoride. The most effective way to deliver the benefits of fluoride to all residents of a community is through water fluoridation. It prevents cavities and saves money for families and the health-care system.

By adjusting the natural fluoride concentration of a community's water supply, community water fluoridation has been successful in lowering the differential prevalence of tooth decay among different socioeconomic, racial, and ethnic groups. Fluoridation as a prevention method is effective, safe, inexpensive, requires no behavioral change by individuals, and does not depend on access or availability of professional services. Fluoridation helps to lower the cost of dental care and dental insurance. It is recognized as an effective measure in maintaining dental health and reducing tooth loss (U.S. DHHS 2000a). In the United States, community water fluoridation has been the basis for the primary prevention of dental caries for over 60 years. Fluoridation has been recognized as one of the ten great achievements in public health in the 20th century (CDC 1999).

*HP 2010* recognizes the importance of community water fluoridation. Objective 21-9 aims to "Increase the proportion of the U.S. population served by community water systems with optimally fluoridated water to 75 percent." In 2002, approximately 162 million people in the United States (68 percent of the population served by public water systems) received optimally fluoridated water (U.S. DHHS 2000a).



Not only does community water fluoridation effectively prevent dental caries, it also offers significant cost savings to almost all communities (Griffin et al. 2001). It has been estimated that every \$1 invested in community water fluoridation saves approximately \$38 in averted dental treatment costs for communities with more than 20,000 residents. The cost-per-person of instituting and maintaining a water fluoridation program in a community decreases with increasing population size. Recent studies show that water fluoridation will reduce childhood dental caries in primary teeth by approximately 18 percent to 40 percent. Although this reduction in decay is not as dramatic as it was in the 1950s and 1960s, it is significant when compared to tooth decay in non-fluoridated communities (CDC MMWR 2001b).

In 1997, the DSHS OHP conducted a study to assess the cost of community fluoridation per average Medicaid child ages one through 20 who



received dental care under Texas Health Steps. The study concluded that an average reduction of \$19 in dental care costs per child could be realized provided communities maintained optimal water fluoridation levels (0.8-1.2 ppm). The Texas Fluoridation Program monitors fluoridation levels in communities and promotes the benefits of fluoridation. Approximately 70 percent of the Texas population benefits from natural or adjusted water fluoridation – all age, income, and ethnic groups benefit regardless of educational attainment (TDH 2000).

### *Topical Fluorides and Fluoride Supplements*

All people should drink water with an optimal fluoride concentration and brush their teeth twice daily with fluoride toothpaste (CDC MMWR 2001b). Frequent exposure to small amounts of fluoride each day most effectively reduces the risk for dental caries. People living in communities that do not receive fluoridated water and persons at high risk for dental caries may need supplemental fluoride. In Texas, community measures include fluoride mouth rinse or tablet programs, which are typically implemented in schools. For those at high risk for caries, supplemental fluoride measures include professionally applied topical fluoride gels or rinses (Jackson et al. 2007).

### *Implications of Topical Fluorides for Public Health*

Fluoride varnish is painted onto teeth and forms an extra barrier against tooth decay. Varnishes contain fluoride for better protection against tooth decay (Cate 1997). Currently varnishes are routinely used to reduce sensitivity from root exposure and are being used to prevent dental caries. Topical fluoride varnishes have been widely used as an operator-applied, caries-prevention intervention for over two decades (Marinho et al. 2003). While the effectiveness of caries

prevention of all topical fluoride treatments is similar, fluoride varnishes hold certain advantages that make them ideal for public health efforts.

The ease of topical fluoride varnish application makes it conducive to application by other health-care professionals. The application takes little time, so the treatment can be incorporated into other health visits. A nurse or physician's assistant can apply the varnish as part of a routine health exam. No special equipment is needed to apply fluoride varnish, making this treatment extremely portable and an ideal prevention method for populations who live in remote areas (i.e., rural areas with no community water fluoridation system). The fluoride concentration is twice that of fluoride gels, but the amount of varnish needed per treatment is ten times less than that of fluoride gels, making varnish an extremely cost effective choice (Weintraub et al. 2006). Varnishes also allow for the slow release of fluoride over time, meaning the teeth are protected longer than by other methods. Varnish is a viable alternative prevention method for populations for whom the other fluoride treatments might be a challenge. Since varnish hardens almost instantaneously, ingestion is less likely. This alone makes it advantageous for children. People who find brushing difficult or who lack the mental capacity to maintain good oral hygiene are ideal candidates for fluoride varnishes. A substantial body of research supports varnish use among children, adolescents, and other populations (ADA 2006). The DSHS OHP is committed to the effective delivery of dental services to prevent tooth decay. As such, OHP will continue to provide topical fluoride varnish as part of preventive dental services for low-income children.

### *Dental Sealants*

A sealant is a plastic material that is usually applied to the chewing surfaces of the back teeth – premolars and molars. This plastic resin bonds into the depressions and grooves (pits and fissures) of the chewing surfaces of back teeth. The sealant acts as a barrier, protecting enamel from plaque and acids. Thorough brushing and flossing help remove food particles and plaque from smooth surfaces of teeth; however, toothbrush bristles cannot reach all the way into the depressions and grooves to extract food and plaque. Sealants protect these vulnerable areas by “sealing out” plaque and food (ADA 2008). Dental sealants are a safe and effective way to prevent cavities among schoolchildren, and in some cases, sealants can arrest incipient tooth decay in the early development stage. The procedure is cost-effective, easily applied, and serves as a barrier from cavity-causing bacteria (NCEMCH 2000; Gilpin 1997; Siegal et al. 2001).

The Food and Drug Administration (FDA) has approved the use of pit and fissure sealants for the prevention of dental caries for many years. These coatings are bonded to susceptible tooth surfaces to protect them from decay. First permanent molars erupt into the mouth at about six years of age. Placing sealants on these teeth shortly after eruption protects them from the development of caries in areas where food may more easily become lodged and cause bacteria to grow. Professional health associations and public health agencies recommend the use of dental sealants to prevent tooth decay. If sealants were applied routinely to susceptible tooth surfaces in conjunction with the appropriate use of fluoride, most tooth decay in children could be avoided. Second permanent molars are also vulnerable to tooth decay.

These teeth erupt into the mouth at about age 12 to 13 years. Dental professionals also recommend that young teenagers receive dental sealants shortly after the eruption of their second permanent molars (U.S. DHHS 2000b).

According to the CDC, in examining the effectiveness of school-based or school-linked dental sealant programs, there was typically a 60 percent decrease in new decayed pit and fissure surfaces for up to two to five years after a single sealant application (CDC MMWR 2001a). School-based and linked programs in the United States generally target vulnerable populations less likely to receive private dental care, such as children eligible for free or reduced lunch programs. Thus, school-based dental sealant programs can increase the prevalence of dental sealants and reduce or eliminate racial and income disparities among children with sealants (CDC MMWR 2001a).

The *HP 2010* target for dental sealants on molars is 50 percent for 8-year-olds and 14-year-olds. Nationally, dental sealants are less prevalent among 14-year-olds than among 8-year-olds. The prevalence of sealants within these age groups varies by race/ethnicity and educational level of the head of household. For example, black and Hispanic children and adolescents are less likely than white children/adolescents to have received dental sealants (U.S. DHHS 2000a).

In order to reach the *HP 2010* target, DSHS is assessing the prevalence of sealants among the population of third-grade children in Texas public schools. From August 2004 through May 2006, DSHS regional-based dental staff screened a sample of 17,344 Texas schoolchildren, including 3,798 third-graders, statewide as part of the Basic Screening Survey (BSS).<sup>2</sup>

Approximately 861 third-grade children (23 percent) had previously sealed teeth when presenting for the BSS (DSHS BSS 2006). Regional dental teams provided sealants to approximately 1,346 third-graders. Table 5 reports the prevalence of dental sealants among eight-year-olds living in Texas in 2006. National averages and *HP 2010* targets are included for comparison.

**Table 5. Percentage of Eight-year-old Children with Dental Sealants on Molar Teeth: U.S. and Texas**

	U.S. <sup>a</sup> (%)	Texas <sup>b</sup> (%)
<i>Healthy People 2010</i> Target	50	50
TOTAL	28	20
Race/ethnicity		
White	35	16
Black	23	17
Hispanic	N/A	23
Other	N/A	46
Sex		
Male	25	20
Female	31	21
Select populations		
Third-grade students (regardless of age)	N/A	23

a Data source: *Healthy People 2010*, Progress Review 2000. U.S. Department of Health and Human Services. Available at [www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls](http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls)

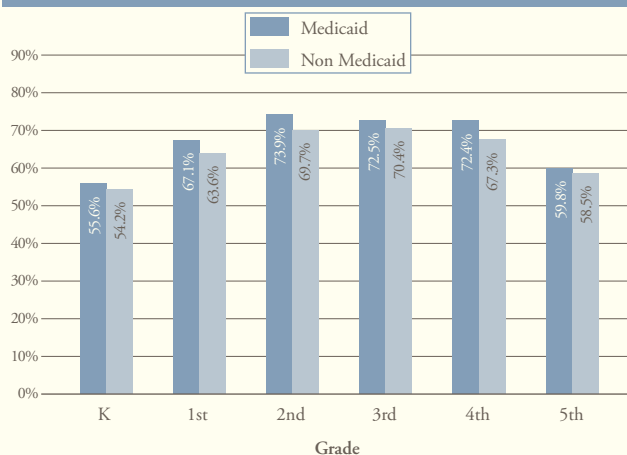
b Data source: Basic Screening Survey, Texas Department of State Health Services, Oral Health Program 2004-2006.

<sup>2</sup> DSHS' OHP has implemented an oral health surveillance system that allows the state to track and monitor the prevalence of dental caries and other measures of oral health status among selected pre-schoolers (i.e. Head Start enrollees, three to five years of age) and third-graders. In August 2006, the first Basic Screening Survey (BSS) was completed. The second BSS, conducted among 3,864 third-grade children, was completed in March 2008. The OHP is currently analyzing the data and will subsequently disseminate its findings to stakeholders.



Among eight-year-olds in Texas, 20 percent have dental sealants on their molar teeth. Twenty-three percent of Hispanic children surveyed have dental sealants on their molar teeth, more than white and black children and those of other races. Children covered by Medicaid were found to

FIGURE 7: CARIES EXPERIENCE BY MEDICAID STATUS AND GRADE

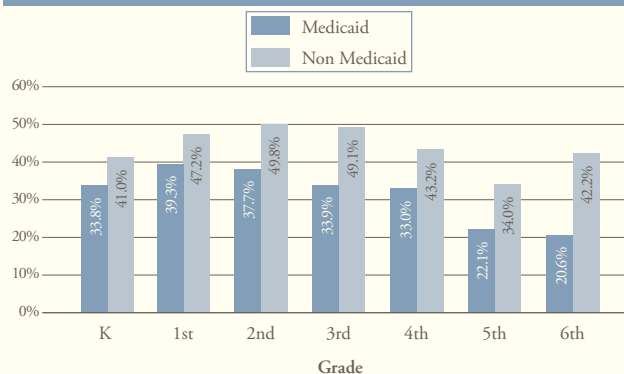


Data Source: Basic Texas Department of State Health Services Screening Survey 2004-2006.

have higher prevalence of dental caries experience (Figure 7), but they were also found to have lower prevalence of untreated dental decay (Figure 8) and higher prevalence of dental sealants (Figure 9) when compared to their peers not covered by Medicaid. These findings indicate that while children on Medicaid may have worse dental health, Medicaid coverage is associated with greater access to both therapeutic and preventive dental services.

Medicaid coverage, however, was associated with both the prevalence of untreated decay and the receipt of dental sealants. A higher proportion of children not covered by Medicaid had untreated decay while a lower proportion had dental sealants (Figure 9). This suggests that low-income children without Medicaid coverage have less access to dental care compared to low-income children with Medicaid coverage.

FIGURE 8: PREVALENCE OF UNTREATED DECAY BY MEDICAID STATUS AND GRADE

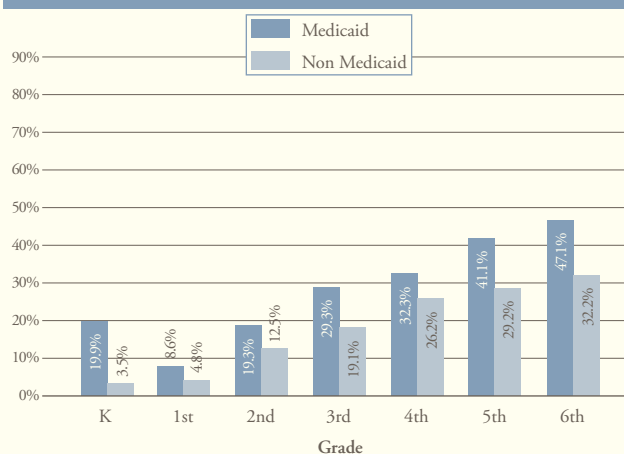


Data Source: Texas Department of State Health Services Basic Screening Survey 2004-2006.

### Preventive Visits

To maintain good oral health, individuals, caregivers, and health-care providers must be vigilant. Daily oral hygiene routines and healthy lifestyle behaviors, which include professional cleanings, are important in oral disease prevention. Regular preventive dental care can reduce the development of disease and facilitate early diagnosis and treatment (Gift et al. 1994).

FIGURE 9: DENTAL SEALANTS BY MEDICAID STATUS AND GRADE



Data Source: Texas Department of State Health Services Basic Screening Survey 2004-2006.

Tooth decay is not the only reason for a dental visit. For example, a child may need additional fluoride, dietary changes, or sealants for ideal oral health. In addition, the pediatric dentist may identify orthodontic problems and suggest treatment to guide the teeth as they erupt in the mouth.

The American Academy of Pediatric Dentistry (AAPD) recommends a dental check-up every six months, starting at the eruption of the first tooth. According to the AAPD: regular dental visits help a child stay cavity-free; regular cleanings remove debris that build up on the teeth, irritate the gums, and cause decay; fluoride treatments renew the fluoride content in the enamel, strengthening teeth and preventing cavities; and hygiene instructions improve a child's brushing and flossing, leading to cleaner teeth and healthier gums (Simmons et al. 1983; AAPD 2008).

One measure of preventive care is the percentage of adults who had their teeth cleaned in the past year. Research shows the quality of the cleaning appears to be more important than the frequency of its performance. The benefits of self-performed oral hygiene have been demonstrated mainly on smooth surfaces of teeth and on front teeth (Bellini et al. 1981). Professional cleaning at regular intervals may inhibit caries on all tooth surfaces.

Each year the Texas BRFSS asks questions regarding approximately 40 risk and health behaviors. One measure of preventive care that is being tracked, as shown in Table 6, is the percentage of adults who had their teeth cleaned in the past year (2006)<sup>c</sup>. Having one's teeth cleaned by a dentist or dental hygienist is indicative of preventive behaviors. In 2006, 60 percent

of Texas adults aged 18 and over reported having had their teeth cleaned by either a dentist or dental hygienist within the past year (TX BRFSS 2006). A review of recent dental visits by race/ethnicity (see Table 6) shows that in Texas in 2006, 66.4 percent

**Table 6. Percentage of Adults Aged 18 or Older Who Had Their Teeth Cleaned Within the Past Year (2006)<sup>c</sup>**

	U.S.	Texas
<b>All adults 18+</b>	63.2	60.2
<b>Age (years)<sup>a</sup></b>		
18–24	61.8	52.3
25–34	60.5	57.6
35–44	66.6	65.4
45–54	66.6	62.6
55–64	65.2	64.1
65 +	57.7	69.9
<b>Race<sup>a</sup></b>		
White	66.7	66.4
Black	52.7	51.1
Hispanic	53.9	54.2
Other <sup>b</sup>	56.2	61.0
<b>Sex<sup>a</sup></b>		
Male	61.0	62.1
Female	65.3	61.3
<b>Education Level<sup>a</sup></b>		
Less than high school	36.0	42.4
High school or G.E.D.	56.4	53.9
Some post-high school	65.5	63.9
College graduate	77.6	73.1
<b>Income<sup>a</sup> (\$)</b>		
Less than 15,000	36.2	35.6
15,000–24,999	44.7	46.3
25,000–34,999	55.3	49.7
35,000–49,999	64.0	55.1
50,000+	78.6	76.8

Source: Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Online Prevalence Data 2006. Available at: [www.cdc.gov/brfss](http://www.cdc.gov/brfss). Texas BRFSS 2006.

a Percentages are dental visits in the past year (2006) within each category (age, race, etc.).

b Asian, Native Hawaiian, Pacific Islander, American Indian, Alaska Native, and other.

c Survey questions that solicit information within the past year or 30 days are from the time when the survey was administered to each particular respondent.

of white, 51.1 percent of black, and 54.2 percent of Hispanic adults (18 years of age or older) have had their teeth cleaned by a dentist within the past year.

### *Screening for Oral Cancer*

Oral cancer detection is accomplished by a thorough examination of the head and neck, mouth (including the tongue), the entire oropharyngeal mucosal tissues, the lips, and palpation of the lymph nodes. Although the sensitivity and specificity of the oral cancer examination have not been established in clinical studies, most experts consider early detection and treatment of precancerous lesions and diagnosis of oral cancer at localized stages to be the major approaches for secondary prevention of these cancers (Silverman 1998; Shah et al. 1999; CDC 1998). If suspicious tissues are detected during an examination, definitive diagnostic tests, such as biopsies, are needed to make a conclusive diagnosis.

Oral cancer is more common after the age of 60 years. Known risk factors include use of tobacco products

and alcohol. Nationally, the risk of oral cancer is increased 6 to 28 times in current smokers. Alcohol consumption is an independent risk factor and, when combined with the use of tobacco products, accounts for most cases of oral cancer in the United States and elsewhere (U.S. DHHS 2004a).

Recognizing the need for dental and medical providers to examine adults for oral and pharyngeal cancer, *HP 2010* Objective 21-7 is to increase the proportion of adults who, in the past 12 months, report having had an examination to detect oral and pharyngeal cancers. Nationally, relatively few adults 40 years of age and older (13 percent) reported receiving an examination for oral and pharyngeal cancer, although the proportion varied by race/ethnicity. No state data has been collected as of yet. However, projections by the Texas Cancer Registry suggest that approximately 2,250 new cases of oral cancer will be diagnosed in Texas during 2006 (Table 7).

**Table 7. Expected New Cases of Oral and Pharyngeal Cancer Among Adults Aged 40 and Over in Texas, 2004-2006**

	Expected New Cases		
	2004	2005	2006
<b>TOTAL</b>	2,136	2,194	2,250
<b>Sex</b>			
Male	1,453	1,496	1,537
Female	683	698	712

Source: Texas Cancer Registry, Cancer and Epidemiology Surveillance Branch, Texas Department of State Health Services January 2006.



### *Tobacco Control*

More than 400,000 Americans die each year as a direct result of cigarette smoking. Tobacco-related illness is the nation's leading preventable cause of premature mortality. Annually, smoking causes over \$150 billion in economic losses (CDC MMWR 2002).

The use of tobacco is a major cause of oral and pharyngeal cancer. The evidence shows that smoking is a determinant of adult periodontitis among other dental ailments (U.S. DHHS 2004a; Duncan & Pitt Ford 2006). Over 50 percent of the cases of periodontal disease in the United States may be attributable to current or former cigarette smoking (Tomar & Asma 2000). Tobacco use substantially reduces the effectiveness of periodontal therapy and dental implants. It inhibits oral wound healing and increases the risk for a wide range of oral soft tissue changes (AAP 1999).

Research has demonstrated that smokers have seven times the risk of developing gum disease as compared to non-smokers, and that tobacco use in any form—cigarette, pipes, and smokeless tobacco—is a risk factor for oral and throat cancer, periodontal diseases, oral fungal infection, impaired healing after periodontal treatment, gingival recession, and dental caries (IARC 2005; U.S. DHHS 2000).

In addition, research shows that young children exposed to secondhand smoke have a higher rate of tooth decay than children who do not grow up around smokers. A study that included approximately 4,000 children ages 4 to 11 linked secondhand smoke to tooth decay in children. It also found that children had an increased risk of tooth decay if they had high levels of cotinine, a nicotine by-product, which is consistent

with secondhand smoke exposure (Aligne et al. 2003). DSHS is involved in promoting a number of programs and policies that would limit the use of tobacco products among Texas residents.

In Texas, tobacco use still remains a leading cause of preventable deaths. A 1998 study by the Texas Department of Health found that one in four of Texas sixth-grade public school students were current users of tobacco. The study also found that 31 percent of the public middle school students and 43 percent of public high school students were current tobacco users (TDH BCDTP 2003). As a result, state health officials, along with regional and local health leaders, have attempted to increase awareness about the use of tobacco by Texas youth and increase enforcement of the state's tobacco laws regarding youths' access to and possession of tobacco products.

**Table 8. Cigarette Smoking (Every Day) Among Adults Aged 18 and Older**

<i>Healthy People 2010 Target:</i> 12%	U.S. (%)	Texas (%)
<b>Total</b>	14.3	12.5
<b>Race/Ethnicity</b>		
White	15.5	13.6
Black	13.7	16.6
Hispanic	8.8	8.6
<b>Sex</b>		
Male	15.6	13.4
Female	13.0	11.8

Source: Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Data for Texas 2006. Available at: [www.cdc.gov/brfss](http://www.cdc.gov/brfss).

The percent of daily smokers in Texas is slightly less than national averages. Among whites (18 years of age or older) in the United States, just over 15 percent smoke cigarettes every day. In Texas, fewer than 14 percent of whites smoke cigarettes every day. However, more blacks in Texas smoke compared to blacks across the United States (Table 8).

As seen in Table 9, the prevalence of cigarette use was slightly higher among Texas high school students than throughout the United States. In Texas, high school boys smoke more than girls (23 percent vs. 19 percent). In Texas, variations in smoking are seen among the different racial/ethnic population groups with 27 percent of white, 11 percent of black and 19 percent Hispanic respondents reported smoking. Whites are more likely to currently smoke cigarettes and chew tobacco than high school students in other race groups. Tobacco control programs that target adults and high school students should use a multifaceted approach in combating smoking and building coalitions with oral health promotion programs.

Visible evidence of tobacco use is readily available in the patient's mouth during dental exams. Nationally,

more than 50 percent of adult smokers visit a dentist each year (Tomar et al. 1996). In 2006 in Texas, among individuals who smoke cigarettes every day, 53 percent reported seeing a dentist within the past year (TX BRFSS 2006). Therefore, dental care facilities offer an excellent location for targeted smoking cessation efforts.

### *Oral Health Education*

Oral health education informs, motivates, and helps people adopt and maintain beneficial health practices and lifestyles. It advocates for environmental changes to support healthy lifestyles and supports professional training and research (Kressin & DeSouza 2003). Although health information or knowledge alone does not necessarily lead to desirable health behaviors, knowledge may help empower people and communities to take action to protect their health.

The exchange of information and the opportunity to educate patients is an every day part of dental practice. The amount of information that is understood and retained by patients and/or their parents/caregivers is not known. However, the improvements of dental

**Table 9. Percentage of Students in High School Who Smoked Cigarettes or Who Used Chewing Tobacco/Snuff One or More of the Past 30 Days (2007)<sup>a</sup>**

	Cigarettes U.S. (%)	Cigarettes Texas (%)	Chewing Tobacco U.S. (%)	Chewing Tobacco Texas (%)
<b>Total</b>	20.0	21.1	7.9	7.9
<b>Race</b>				
White	23.2	26.5	10.3	12.8
Black	11.6	10.8	1.2	2.8
Hispanic	16.7	19.3	4.7	4.6
<b>Sex</b>				
Male	21.3	23.0	13.4	13.1
Female	18.7	19.1	2.3	2.6

<sup>a</sup> Survey questions that solicit information within the past year or 30 days are from the time when the survey was administered to each particular respondent.

Data Source: a Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Youth Risk Behavior Surveillance System (YRBS) 2007. Available at <http://apps.nccd.edc.gov/yrbs/index.asp>



hygiene, as well as education directed at dietary modifications, are considered important measures in dental health education and oral disease outcomes (Blinkhorn 1998; Tinaoff et al. 2002).

The effects of oral health education and instruction and caries prevention have been established as successful in the prevention of oral disease. Dental health professionals and stakeholders in Texas recognize the importance of oral health promotion. The literature shows that caries and periodontitis are diseases closely correlated with oral hygiene status. The patient's understanding of oral structures and his or her interest in preserving or restoring healthy teeth and gums depends on instruction and motivation.

### *Oral Health Coalitions*

In 2005, the Texas Oral Health Coalition (TxOHC) was established to promote optimal oral health for all Texans through statewide partnerships (TxOHC 2008). This coalition consists of stakeholders from government, dental offices, faith-based organizations, nonprofit

organizations, professional education, third-party payer groups, community interest groups, and the public.

Established partnerships include, but are not limited to:

- Health and Human Services Commission (HHSC);
- Texas Department of State Health Services Oral Health Program (DSHS OHP);
- Texas Dental Association (TDA);
- Texas Academy of Pediatric Dentists (TAPD);
- Texas Dental Hygienists' Association (TDHA);
- Texas Dental Hygiene Educators' Association (TDHEA);
- Regional oral health coalitions;
- Texas Health Steps (THSteps);
- Texas Fluoridation Project (TFP);
- Women, Infants, and Children's (WIC) Program;
- Texas Head Start State Collaboration Office;
- Maternal and Child Health (MCH) Program;
- Children with Special Health Care Needs Services Program (CSHCN-SP);
- Local health departments;
- School nurses;
- School districts;
- University of Texas Health Science Center at San Antonio, Dental and Dental Hygiene Schools;
- University of Texas Dental Branch, Houston;
- Texas A&M;
- Baylor College of Dentistry;
- Texas Nurses' Association;
- Faith-based organizations; and
- Community-based organizations across Texas.



TxOHC priorities include:

- Early education and early intervention for young children;
- Identifying oral health issues for all populations;
- Identifying opportunities, challenges, and gaps in delivery of oral health services;
- Raising awareness among legislators, the public and other groups about the need to improve oral health access; and
- Developing action plans for the implementation of the state's Collaborative Oral Health Plan in Texas (Brown & Steffensen 2005).

During its first year, TxOHC successfully collaborated with child-health advocacy groups to support legislation that restored dental benefits in the Texas Children's Health Insurance Program (CHIP). Through efforts of the coalition and its collaborative partners, CHIP dental benefits were reinstated in April 2006 (Texas CHIP Coalition 2008). Figure 10 shows the eight regional oral health coalitions in Texas: Greater Houston, Central Texas, South Plains (Lubbock), Amarillo, El Paso, Harlingen, West Texas, and Tarrant County.

The coalitions advocate for improved oral health services in Texas by:

- Identifying oral health issues for all populations within Texas;
- Reviewing, revising, and implementing the Collaborative Oral Health Plan;

- Educating legislators, stakeholders, and the public about the need to improve access to oral health services; and
- Informing and advocating for policy issues regarding oral health.

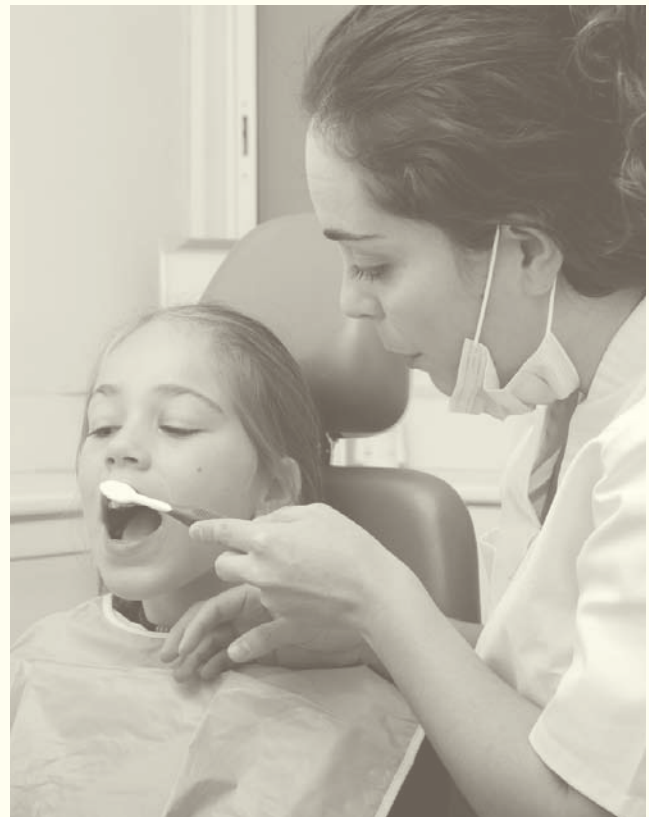
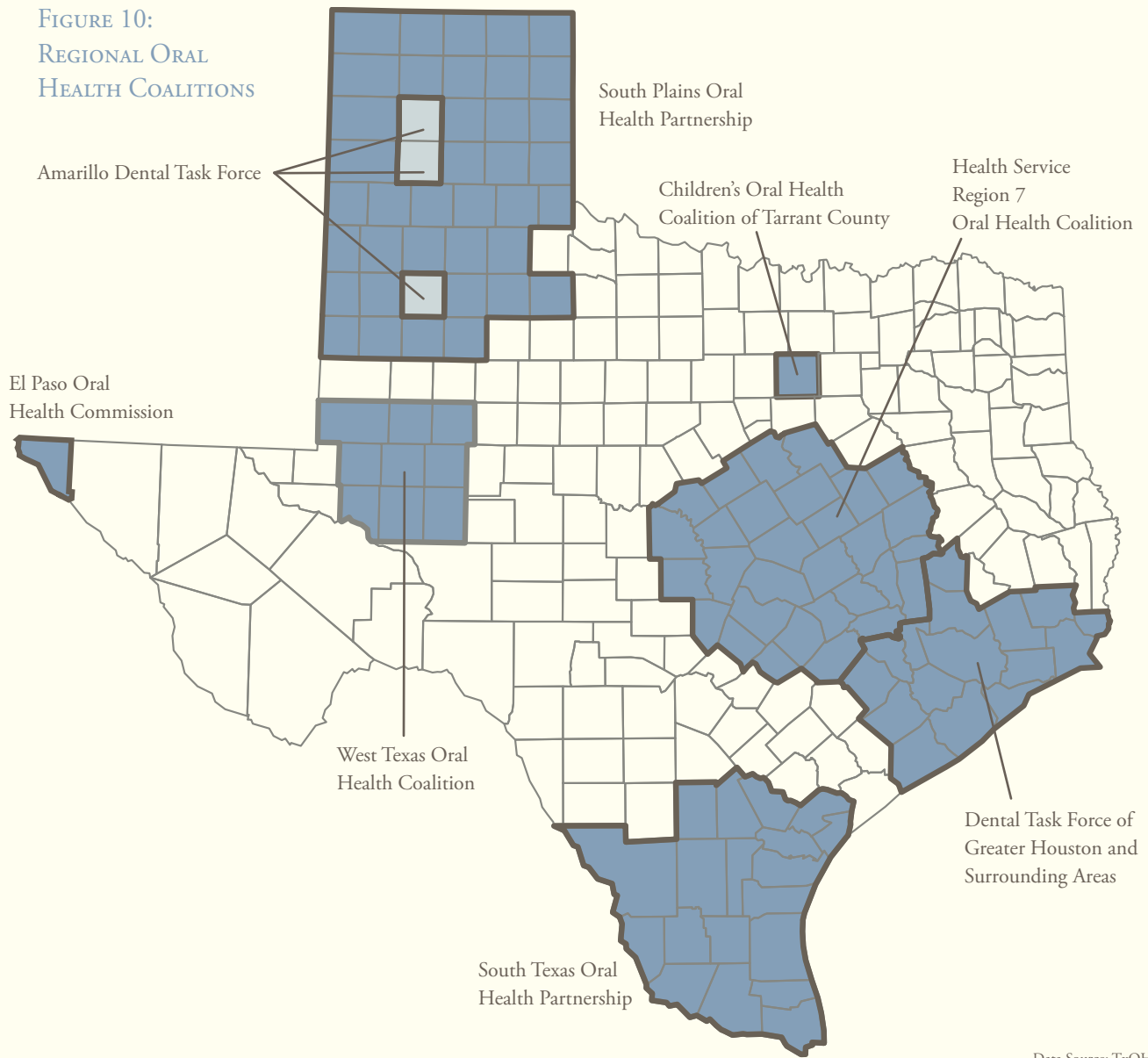


FIGURE 10:  
REGIONAL ORAL  
HEALTH COALITIONS





## PROVISION *of* DENTAL SERVICES

Dentists, dental hygienists, and dental assistants work collaboratively to provide diagnostic, preventive, therapeutic, and orthodontic services in Texas. Effective health policies intended to expand access, improve quality, or contain costs must consider the supply, distribution, preparation, and utilization of the available health workforce. The oral health-care workforce is critical to Texans' ability to obtain high quality dental care.

### *Dental Workforce and Capacity*

#### *Dentists*

Dentists diagnose and treat conditions that affect the mouth. Dentists may collect information for patient assessment, examine teeth and gums, perform dental cleanings, and implement procedures to prevent dental decay. Dentists may also prescribe medications, make incisions, or extract any mass related to any disease, pain, injury, deficiency, deformity, or physical condition of the mouth, including the teeth, gums, and adjacent structures. While most dentists are general dentists, some dentists specialize in certain areas of dentistry, such as orthodontics or periodontics (TSBDE 2008). For the purpose of this report, the term "general dentists" will include dentists with the specialties of general, public health, and pediatric dentistry. Statistics are reported only for dentists who are non-federal, not in a dental residency program, and who are currently licensed and practicing dentistry in Texas.

#### *Number of Dentists*

There is a need to expand access to dental care for children and adults in many parts of Texas. Lack of dentists in some Texas counties – and particularly in the rural areas – is a barrier for many children and adults (Brown & Steffensen 2005). From 1991 to 2000, the number of dentists grew by 8.3 percent, while the population grew by 20 percent. The result was a 7.4 percent decrease in the number of dentists per 100,000 people. In Texas, the overall number of dentists per 100,000 people peaked at 39.4 in 1991. In 1999, the ratio of dentists per 100,000 was 60.4 (DSHS CHS HRPC 2007). As of May 2008, there are 11,121 active dentists in Texas (TSBDE 2008).

#### *Dental Hygienists*

Dental hygienists are prevention specialists who, under the guidance of a licensed dentist, collect information for patient assessment, examine teeth and gums, perform dental cleaning, and apply medicines to reverse the decay process. Dental hygienists are required to have graduated from a dental hygiene program accredited by the Commission on Dental Accreditation under the auspices of the American Dental Association. Dental hygienists are licensed after passing both a regional clinical board and national written board examination. The Texas State Board of Dental Examiners (TSBDE) regulates dental hygiene practitioners.

### *Number of Dental Hygienists*

The number of dental hygienists per 100,000 Texans has steadily increased since 1981, when there were 23.5 dental hygienists per 100,000 persons. In 2007, there were 9,188 dental hygienists in Texas, for a ratio of 38.7 dental hygienists per 100,000 persons. (DSHS CHS HRPC 2007).

### *Dental Health Professional Shortage Areas*

The number of health-care providers available to service an area impacts the quality and quantity of health care received. The number of dentists is the primary indicator used to determine if an area is a Dental Health Professional Shortage Area (DHPSA). Currently more than 34 state public health programs use Health Professional Shortage Area (HPSA) designation to determine eligibility for funding. Approximately 20 percent of the population of the United States resides in HPSAs (DSHS Primary Care Office 2006).

Across Texas, 82 entire counties have been designated as DHPSAs, and 27 counties have been designated as partial DHPSAs. Areas with a ratio of less than one dentist for every 3,000 residents would meet the “dentist to population ratio” requirement as specified in the federal designation eligibility criteria for a DHPSA. Other eligibility criteria used to establish a DHPSA include the area’s poverty and fluoridation rates. These eligibility criteria are used to determine if an area has insufficient capacity to meet existing needs. An area’s insufficient capacity is indicated by the time needed in advance of an appointment, number of patient visits during a full-time work week, and the number of providers not accepting new patients.

According to the National Health Service Corps, Texas would need an additional 784 dentists to achieve the

recommended ratio of one dentist for every 3,000 residents (DSHS Primary Care Office 2006). Table 10 shows the distribution of dentists per 100,000 in border and non-border regions of Texas. The table also shows the number of dentists per 100,000 residents in locations that have been designated as either whole or partial DHPSAs.

As seen in Table 10, the dentist-patient ratio seen among rural dentists is lower than among urban dentists. Low-income populations in rural areas are potentially less likely to have access to dental care than low-income populations in urban areas.

**Table 10. Dentists Per 100,000 Residents by Region and DHPSA Designation in Texas**

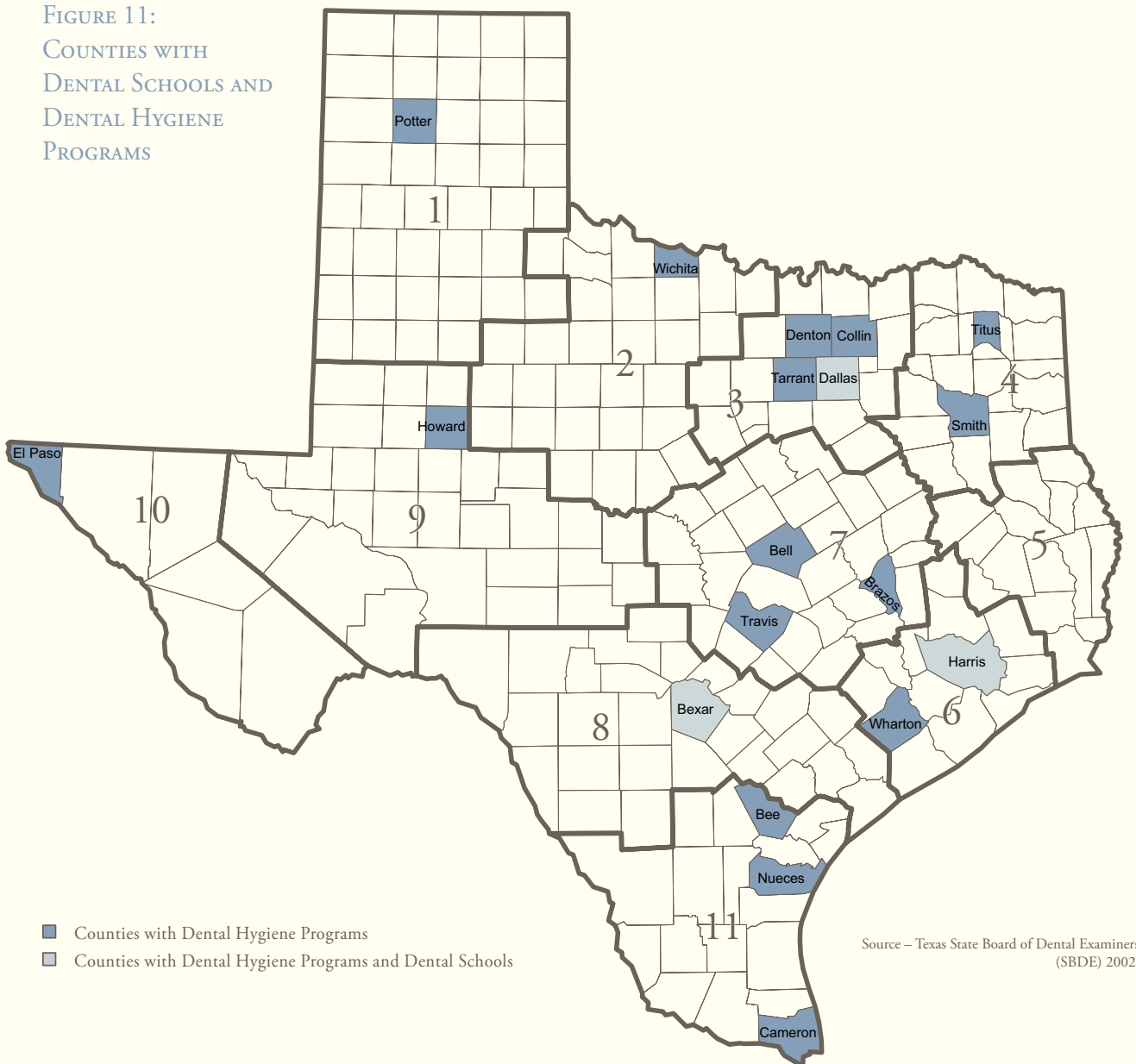
<b>Total, Texas</b>	
82 Counties designated as whole-county DHPSAs	14.6
28 Counties designated as partial-county DHPSAs	42.5
144 Counties not designated as DHPSAs	35.5
<b>Border</b>	
Metropolitan	15.7
Non-metropolitan	11.8
<b>Non-border</b>	
Metropolitan	41.1
Non-metropolitan	25.2

Source: Texas DSHS 2007, <http://www.dshs.state.tx.us/CHS/hprc/hpsa.shtm>

### *Dental Educational Institutions*

There are three schools of dentistry in Texas: Baylor College of Dentistry; University of Texas Health Science Center at Houston Dental Branch; and University of Texas Health Science Center at San Antonio Dental School (TSBDE 2007). Texas has 21 schools with dental hygiene programs. The dental schools and dental hygiene programs are primarily located in the urban counties of Texas. Only four dental hygiene programs are located in rural and border counties of Texas (Figure 11).

FIGURE 11:  
COUNTIES WITH  
DENTAL SCHOOLS AND  
DENTAL HYGIENE  
PROGRAMS



### *Dental Workforce Diversity*

Increasing the number of dental professionals from under-represented racial and ethnic groups is viewed as an integral part of the solution to improving access to care (U.S. DHHS 2000b). Data on the race/ethnicity of dental care providers were derived from surveys of professionally active dentists conducted by the American Dental Association (ADA 1999). This survey found that

1.9 percent of active dentists in the United States identified themselves as black, although blacks are 12.1 percent of the population of the United States. Hispanic dentists made up 2.7 percent of dentists in the United States, compared with the 10.9 percent of the United States population that is Hispanic. Studies show that in Texas, black dentists treat a higher percentage of black patients and a higher percentage of economically disadvantaged patients. Without minority

practitioners, access to quality dental care will be limited or absent to minority communities throughout the United States (Sinkford et al. 1996).

## Use of Dental Services

### General Population of the United States

Adults who do not receive regular professional care can develop oral diseases that eventually require complex treatment and may lead to tooth loss and health problems. People who have lost all their natural teeth are less likely to seek periodic dental care than those with teeth, which decreases the likelihood of early detection of oral cancer or soft tissue lesions resulting from medications, medical conditions, and tobacco use, as well as from poor-fitting or poorly maintained

dentures. Prevalence of recent dental visits is shown in Table 11.

Texans visited the dentist more frequently in the past 12 months compared to others in the United States (2006)<sup>d</sup>. Although appropriate home oral health care and population-based prevention are essential, professional care is also necessary to maintain optimal oral health. Regular dental visits provide an opportunity for the early diagnosis, prevention, and treatment of oral diseases and conditions for people of all ages, and for the assessment of self-care practices.

## Special Populations

### Schoolchildren

Figures 12 and 13 present data from the National Health and Nutrition Examination Survey and the National Survey of Children's Health (for Texas). For dental care by racial/ethnic category, Texas was lower than national averages among white and Hispanic children and adolescents.

**Table 11. Proportion of Persons Who Visited a Dentist in the Previous 12 Months**

	U.S. <sup>a</sup> (%)	Texas <sup>b</sup> (%)
<b>TOTAL</b>	43	60.8
<b>Race/ethnicity</b>		
White	46	67.9
Black	27	55.7
Hispanic	27	53.2
<b>Sex</b>		
Male	46	62.6
Female	39	63.0
<b>Education Level (persons aged 25 years and over)</b>		
Less than high school	24	43.5
High school graduate	41	56.0
At least some college	57	71.7
<b>Select populations</b>		
Children aged 2 to 17 years	48	75.2 <sup>c</sup>
Children, adolescents, and young adults aged 2 to 17 years, <200%FPL	33	69.2 <sup>c</sup>
Adults aged 18+	41	62.9

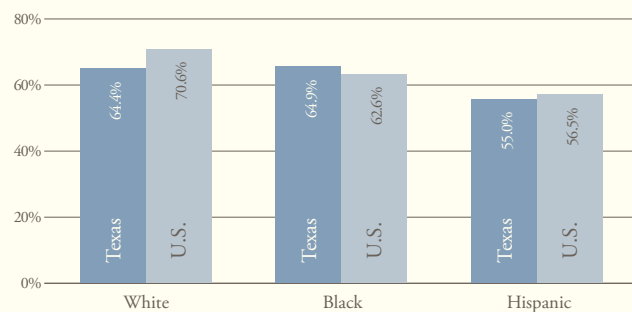
a Medical Expenditure Panel Survey 2000, AHRQ. Available at: [www.cdc.gov/nchs/ppthpdata2010/focusareas/fa21.xls](http://www.cdc.gov/nchs/ppthpdata2010/focusareas/fa21.xls) *Healthy People 2010* Progress Review; U.S. Department of Health and Human Services 2000.

b Texas Behavioral Risk Factor Surveillance System (TX BRFSS) 2006.

c Data reported are for children and adolescents ages 2–17 from National Survey of Children's Health (NSCH) 2003. All data are weighted.

d Survey questions that solicit information within the past year or 30 days are from the time when the survey was administered to each particular respondent.

**FIGURE 12: PREVENTIVE DENTAL CARE IN PAST 12 MONTHS (2003) AMONG CHILDREN AND ADOLESCENTS BY RACE/ETHNICITY**

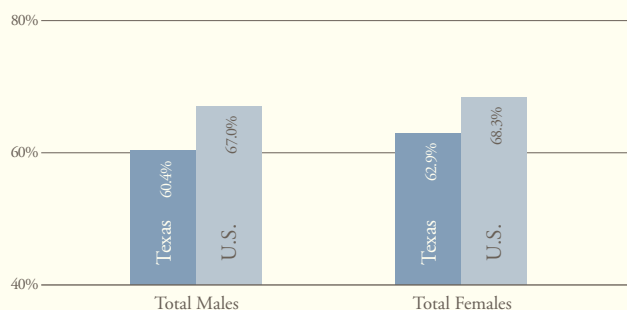


Sample age group is 2 to 17 years of age. United States and Texas data is from the National Survey of Children's Health (NSCH) 2003.

When state and national data for preventive visits are examined by sex, some notable differences are apparent (Figure 13). National averages for preventive dental visits

among children and adolescents are higher for both boys and girls as compared to boys and girls in Texas.

FIGURE 13: PREVENTIVE DENTAL CARE IN PAST 12 MONTHS (2003)<sup>a</sup> AMONG CHILDREN AND ADOLESCENTS BY SEX



<sup>a</sup> Survey questions that solicit information within the past year or 30 days are from the time when the survey was administered to each particular respondent.

Sample age group is 2 to 17 years of age. Texas data is from the National Survey of Children's Health (NSCH), 2003.

### *Pregnant Women*

Studies documenting the effects of hormones on the oral health of pregnant women suggest that 25 percent to 100 percent of these women experience gingivitis, and up to 10 percent may develop more serious oral infections (Amar & Chung 1994). Recent evidence suggests that oral infections during pregnancy, such as periodontitis, may increase the risk of pre-term or low birth weight deliveries (Offenbacher et al. 2001). During pregnancy, a woman may be particularly amenable to disease prevention and health promotion interventions that could enhance her health and that of her fetuses (Gaffield et al. 2001; Steinberg 1999).

### *Dental Medicaid and State Children's Health Insurance Programs*

THSteps Dental (funded by Title XIX) provides oral health care to Medicaid-eligible children served by enrolled Medicaid providers. Title V funds (Maternal and Child Health Block Grant) provide oral health care to non-Medicaid-eligible children through Title V fee-for-service (FFS) contracted providers. The DSHS OHP

provides preventive dental services, including a school-based dental sealant program, to schoolchildren and children in participating Head Starts through portable clinics. The Children with Special Health Care Needs Services Program provides oral care to eligible children.<sup>3</sup> The Texas Water Fluoridation Program provides technical assistance to community water systems, monitors fluoridation levels in communities, and promotes the benefits of fluoridation.

### *Medicaid*

Medicaid is a primary source of health care for low-income families in the United States. This program became law in 1965 and is jointly funded by the federal and state governments to assist states in providing medical, dental, and long-term care assistance to people who meet certain eligibility criteria. Dental services are provided for most Medicaid-eligible individuals under the age of 21, as a required component of the Early Periodic Screening, Diagnosis, and Treatment (EPSDT) benefit. Services must include, at a minimum, relief of pain and infections, restoration of teeth, and maintenance of oral health. Dental services may not be limited to emergency services for EPSDT recipients (Centers for Medicare and Medicaid Services 2004). Preventive and maintenance services covered by THSteps include dental examinations, cleanings, application of topical fluoride, application of sealants to certain teeth, and oral health education.

<sup>3</sup> Applicants who are less than 18 years of age and are applying for the CSHCN Services Program must also apply to Medicaid, the Medically Needy Program (MNP), and to CHIP. A written determination from Medicaid and CHIP must be sent with the application for the CSHCN Services Program. Applicants who are not legal residents or citizens of the United States, or those who are currently enrolled in CHIP or Medicaid, are exempt from this requirement (CSHCN Program Manual 2008).

Additionally, THSteps covers treatment services which include, but are not limited to, restorative, periodontal treatments, and oral surgery (Texas Medicaid and Healthcare Partnership – Texas Health Steps 2007).

Table 12 shows that in State Fiscal Year (SFY) 2006, 47 percent of THSteps eligibles ages 1-20 accessed dental services and in 2007 this proportion increased to 50 percent.

**Table 12. THSteps Eligibles Accessing Dental Services, Ages 1–20**

	2006	2007
Number of Eligibles (%)	1,223,027 (47%)	1,317,977 (50%)

Data source: DHHS Centers for Medicare and Medicaid Service SFY 2006 – 2007, Form CMS-416: Annual EPSDT Participation Report.

#### *Children's Health Insurance Program*

During the 2003 Texas legislative session, Children's Health Insurance Program (CHIP) dental benefits were eliminated. In 2006, CHIP dental benefits were reinstated. CHIP is designed specifically to assist children who lack private insurance coverage and whose families typically earn too much to qualify for the Texas Medicaid Program. Texas CHIP Dental Services is underwritten by Delta Dental Insurance Company (Delta Dental 2008). In December of 2007, there were a total of 349,135 children and adolescents (0 to 18 years of age) enrolled in a CHIP program in Texas (TX HHSC 2007). At that time, more than 200,000 children enrolled were between the ages of 6 and 14.

#### *Community and Migrant Health Centers and other State, County, and Local Programs*

Community Health Centers (CHCs) and Federally Qualified Health Centers (FQHCs) provide family oriented primary and preventive health-care services for people living in rural and urban medically

underserved communities (TACHC 2008). CHCs exist in areas where economic, geographic, or cultural barriers limit access to primary health care. The Migrant Health Program (MHP) supports the delivery of migrant health services and serves more than 650,000 migrant and seasonal farm workers nationally (MHP 2006). Many CHCs and Migrant Health Centers provide dental care services, in addition to other services.

As of 2008, the Texas Association of Community Health Centers (TACHC) has 56 member organizations which are FQHCs, many of which have more than one site. Membership in this association is purely voluntary (TACHC Membership Directory 2002). Texas has 59 FQHCs that serve predominately uninsured, low-income/indigent, and minority children and women. In Texas, FQHCs are required to provide access to dental services (DSHS Primary Care Office 2008).

*HP 2010* objective 21-14 is to "Increase the proportion of local health departments and community-based health centers, including community, migrant, and homeless health centers, that have an oral health component" (U.S. DHHS 2000b). In 2002, 61 percent of local jurisdictions and health centers had an oral health component (U.S. DHHS 2004b); the *HP 2010* target is 75 percent nationally.

Indigent populations with no access to dental care and populations who are not covered by dental insurance plans may have access to dentists through state and/or locally funded dental care programs, fee-for-service plans, sliding-fee-scale plans, and charity care. The principal option of these poverty-level and indigent populations is fee-for-service plans, which most cannot afford, or state and/or locally funded dental care programs that are limited in the number of clients they can serve.

## CONCLUSIONS

---

Oral diseases have a significant impact on the oral and general health and the well-being of all people. Oral health problems have psychological, social, and economic consequences ranging from poor self-image, social isolation, and diminished work and academic capacity.

The relationship between poor or no health-care coverage and poor health are explicit in the issues of oral health. Mouth and throat diseases — ranging from cavities to cancer — cause pain and disability for millions of Americans. This fact is disturbing because almost all oral diseases can be prevented. In 2000, the Surgeon General found that “there are profound and consequential disparities in the oral health of our citizens. Indeed, what amounts to a ‘silent epidemic’ of oral diseases is affecting some population groups. This burden of disease restricts activities in school, work, and home, and often significantly diminishes the quality of life” (U.S. DHHS 2000).

Texas is a diverse, vast, and complex state. Its public health system is equally complex. However, the functions and topics of public health extend beyond disease prevention or provision of health care for the uninsured or impoverished. With its vision of a healthy Texas and mission to improve health and well-being in Texas, DSHS is responsible for public health in Texas and holds the responsibility of safeguarding the health and well-being of its residents.

*Oral Health in Texas 2008* is intended to bring oral health issues to the forefront of the public. The document serves as a gauge for the progress Texas is making in reaching the *HP 2010* oral health goals. Only through understanding the current oral health challenges and through collaborative efforts by public and private agencies, businesses, communities, and individuals can the oral health of Texas residents be improved.





## REFERENCES

---

- Aday L.A., Forthofer R.N. A profile of Black and Hispanic subgroups' access to dental care: Findings from the National Health Interview Survey. *Journal of Public Health Dentistry*. 1992; 52:210-15.
- Agency for Healthcare Research and Quality (AHRQ). 2002. Available from: <http://www.ahrq.gov>.
- Aligne C.A., Moss M.E., Auinger P., Weitzman M. Association of pediatric dental caries with passive smoking. *Journal of the American Medical Association (JAMA)*. 2003; 289:1,258-64.
- Amar S., Chung K.M. Influence of hormonal variation on the periodontium in women. *Journal of Periodontology* 2000. 1994; 6:79-87.
- American Academy of Pediatric Dentistry (AAPD). Promoting oral health in young children. Accessed 2008 Apr 28 and available from: [http://www.healthychildcare.org/pdf/oral\\_health.pdf](http://www.healthychildcare.org/pdf/oral_health.pdf)
- American Dental Association (ADA). Distribution of dentists in the United States by region and state, 1997. Chicago: American Dental Association Survey Center; 1999.
- American Dental Association (ADA). 2006. Available from: [http://www.ada.org/prof/resources/topics/science\\_fluoride\\_varnish.asp](http://www.ada.org/prof/resources/topics/science_fluoride_varnish.asp)
- American Dental Association (ADA). 2008. Available from: <http://www.ada.org/public/topics/sealants.asp>
- American Health Association (AHA), Texas Health Association (THA). Annual survey of hospitals. 2001.
- Beck J.D., Offenbacher S., Williams R., Gibbs P., Garcia R. Periodontics: A risk factor for coronary heart disease. *Annals of Periodontal Disease*. 1998; 3(1):127-41.
- Bellini H.T., Arneberg P., Von der Fehr F.R. Oral hygiene and caries: A review. *Acta Odontologica*. 1981; 39(5):257-65.
- Blinkhorn A.S. Dental health education: What lessons have we ignored? *British Dental Journal*. 1998; 184(2):8-59.
- Blot W.J., McLaughlin J.K., Winn D.M., Austin D.F., Greenberg R.S., Preston-Martin S. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Research*. 1988; 48(11):3,282-87.
- Brown J.P., Steffensen J.E.M. Collaborative oral health plan in Texas. University of Texas Health Science Center at San Antonio. 2005. Available from: <http://www.dshs.state.tx.us/dental/reports.shtm>
- Bureau of Primary Health Care. Community health centers: Program information. 2005.
- Burt B.A., Eklund B.A. *Dentistry, dental practice, and the community*. 5th ed. Philadelphia: W.B. Saunders; 1999.

- Burtner A.P., Dicks J.L. Providing oral health care to individuals with severe disabilities residing in the community: Alternative care delivery system. *Special Care in Dentistry*. 1994; 14:188-93.
- Carroll P., Shute R. School peer victimization of young people with craniofacial conditions: A comparative study. *Psychology, Health and Medicine*. 2005; 10(3):291-304.
- Cate J.M. Review on fluoride with special emphasis on calcium fluoride mechanisms in caries prevention. *European Journal of Oral Sciences*. 1997; 105(5):461-65.
- Caufield P.W., Cutter G.R., Dasanayake A.P. Initial acquisition of mutans streptococci by infants: Evidence for a discrete window of infectivity. *Journal of Dental Research*. 1993; 72(1):37-45.
- Caufield P.W., Griffen A.L. Dental caries: An infectious and transmissible disease. *Pediatric Clinics of North America*. 2000; 47(5):1,001-19.
- Caufield P.W., Wannemuehler Y.M., Hansen J.B. Familial clustering of the streptococcus mutans cryptic plasmid strain in a dental clinic population. *Infection and Immunity*. 1982; 38(2):785-87.
- Centers for Disease Control and Prevention (CDC). Community water fluoridation: Fluoridation consensus. 1998.
- Centers for Disease Control and Prevention. Preventing and controlling oral and pharyngeal cancer. Recommendations from a national strategic planning conference. In: *Morbidity and Mortality Weekly Report (MMWR)*. 1998; 47(RR-14).
- Centers for Disease Control and Prevention. Achievements in public health, 1990-1999: Fluoridation of drinking water to prevent dental caries. *Morbidity and Mortality Weekly Report (MMWR)*. 1999; 48(41):933-40.
- Centers for Disease Control and Prevention, National Program of Cancer Registries (NPRC). 2001.
- Centers for Disease Control and Prevention. Impact of targeted, school-based dental sealant programs in reducing racial and economic disparities in sealant prevalence among schoolchildren — Ohio 1998-1999. *Morbidity and Mortality Weekly Report (MMWR)*. 2001a; 45(34):736-38.
- Centers for Disease Control and Prevention. Recommendations for using fluoride to prevent and control dental caries in the United States. *Morbidity and Mortality Weekly Report (MMWR)*. 2001b; 50 (RR-14):1-42.
- Centers for Disease Control and Prevention. Annual smoking-attributable mortality, years of potential life lost, and economic costs — United States, 1995-1999. *Morbidity and Mortality Weekly Report (MMWR)*. 2002; 51(14):300-03.
- Centers for Disease Control and Prevention. The health consequences of smoking: A report of the surgeon general. Atlanta: Department of Health and Human Services, National Center for Chronic Disease Prevention and Health Promotion, Offices on Smoking and Health (Washington, DC); 2004. (For sale by the Superintendent of Documents, U.S. General Purchasing Office.)
- Centers for Disease Control and Prevention, Division of Oral Health, Water Fluoridation Reporting System (WFRS). Water fluoridation by county. Accessed 2008 May 5. Public access to WFRS information, oral health data systems, and oral health maps – Texas available from: <http://apps.nccd.cdc.gov/gisdoh/waterfluor.aspx>

- Centers for Medicare and Medicaid Services. National health expenditure (NHE) amounts by type of expenditure and source of funds: Calendar years 1965-2013 (updated 2004). Available from: [http://www.cms.hhs.gov/MedicaidEarlyPeriodicScrn/02\\_Benefits.asp](http://www.cms.hhs.gov/MedicaidEarlyPeriodicScrn/02_Benefits.asp)
- Children with Special Health Care Needs (CSHCN), Maternal and Child Health Bureau of the U.S. Department of Health and Human Services. 2001-2002.
- Children with Special Health Care Needs (CSHCN). Texas Medicaid & healthcare partnership program manual. 2008.
- Christen A.G., McDonald J.O., Christen J.A. The impact of tobacco use and cessation on nonmalignant and precancerous oral and dental diseases and conditions. Indianapolis: Indiana University School of Dentistry; 1991.
- Collett B., Speltz M. Social-emotional development of infants and young children with orofacial clefts. *Infants and Young Children: An Interdisciplinary Journal of Special Care Practices*. 2006; 19(4):262-91.
- Dasanayake A.P. Poor periodontal health of the pregnant woman as a risk factor for low birth weight. *Annals of Periodontal Disease*. 1998; 3:206-12.
- Davenport E.S., Williams C.E., Sterne J.A., Sivapathasundram V., Fearn J.M., Curtis M.A. The East London study of maternal chronic periodontal disease and pre-term low birth weight infants: Study design and prevalence data. *Annals of Periodontal Disease*. 1998; 3:213-323.
- Day G.L., Blot W.J., Austin D.F., Bernstein L., Greenberg S., Preston-Martin S., Schoenberg J.B., Winn D.M., McLaughlin J.K., Fraumeni J.E., Jr. Racial differences in risk of oral and pharyngeal cancer: Alcohol, tobacco, and other determinants. *Journal of the National Cancer Institute*. 1993; 85(6):465-73.
- DeLeeuw R., Studts J.L., Carson C.R. Fatigue and fatigue-related symptoms in an orofacial pain population. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2005; 99(2):168-74.
- Delta Dental. 2008. Available from: [http://www.deltadentalins.com/group\\_sites/tchip/index.html](http://www.deltadentalins.com/group_sites/tchip/index.html) and <http://www.chipmedicaid.org>.
- Department of Health and Human Services, Centers for Medicare and Medicaid Service. Annual early and periodic screening, diagnostic, and treatment (EPSDT) participation report (Texas) [form CMS-416]. SFY 2006-2007.
- Department of State Health Services (DSHS), Basic Screening Service (BSS). 2006.
- Department of State Health Services for Health Statistics, Health Professional Resource Center (DSHS CHS HRPC). Available from: <http://www.dshs.state.tx.us/CHS/hprc/publicat.shtm>
- DeStefani E., Deneo-Pellegrini H., Mendilaharsu M., Ronco A. Diet and risk of cancer of the upper aerodigestive tract — I: Foods. *Oral Oncology*. 1999; 35(1):17-21.
- Duncan H.F., Pitt Ford T.R. The potential association between smoking and endodontic disease. *International Endodontic Journal*. 2006; 39(11):843-54.
- Edelstein B.L. Disparities in oral health and access to care: Findings of national surveys. *Ambulatory Pediatrics*. 2002; 2(2):141-47.
- Finn E., Wolpin S. Dental diseases in infants and toddlers: A transdisciplinary health concern and approach. *Zero to Three*. 2005; Jan:28-33.

- Franco E.L., Dib L.L., Pintos D.S., Lombardo V., Contestini H. Race and gender influences on the survival of patients with mouth cancer. *Journal of Clinical Epidemiology*. 1993; 46(1):37-46.
- Frazier P.J. School-based instruction for improving oral health: Closing the knowledge gap. *International Dental Journal*. 1980; 30(3):257-68.
- Garfield M.L., Gilbert B.J., Malvitz D.M., Romaguera R. Oral health during pregnancy: An analysis of information collected by the pregnancy risk assessment monitoring system. *The Journal of the American Dental Association*. 2001; 132(7):1,009-16.
- Gift H.C., Corbin S.B., Nowjack-Raymer R.E. Public knowledge of prevention of dental disease. *Public Health Reports*. 1994; 109.
- Gilpin J.L. Pit and fissure sealants: A review of the literature. *Journal of Dental Hygiene*. 1997; 71(4):150-8.
- Griffin S.O., Jones K., Tomar S.L. An economic evaluation of community water fluoridation. *Journal of Public Health Dentistry*. 2001; 61(2):78-86.
- Health and Human Services Commission System Forecasting, Department of State Health Services (DSHS). Budget revenue. 2007.
- Health Resources and Services Administration (HRSA). 2002.
- Herrero R. Chapter 7: Human papillomavirus and cancer of the upper aerodigestive tract (monograph). *Journal of the National Cancer Institute*. 2003; 31:47-51.
- Hilton I.V., Stephen S., Barker J.C., Weintraub J.A. Cultural factors and children's oral health care: A qualitative study of carers of young children. *Community Dentistry and Oral Epidemiology*. 2007; 35(6):429-38.
- Holm, G. Smoking as an additional risk for tooth loss. *Journal of Periodontology*. 1994.
- Houston V., Bull R. Perceived effect of abnormal facial appearance. *European Journal of Social Psychology*. 1994; 24(2):279-84.
- Illinois State Health Department. Survey of state dental directors. 1997.
- International Agency for Research on Cancer (IARC). Smokeless tobacco and some related nitrosamines. IARC monographs on the evaluation of carcinogenic risks to humans. Lyon, France: World Health Organization, International Agency for Research on Cancer (in preparation); 2005:89.
- Jackson D.M., Jahnke L.R., Kerber L., Nyer G., Siemens K., Clark C. Creating a successful school-based mobile dental program. *Journal of School Health*. 2007; 77(1):1-6.
- Jeffcoat M.K., Geurs N.C., Reddy M.S., Cliver S.P., Goldenner R.L., Hauth J.C. Periodontal infection and pre-term birth: Results of a prospective study. *The Journal of the American Dental Association*. 2001; 132(7):875-80.
- Kelly S.E., Binkley C.J., Neace W.P., Gale B.S. Barriers to care-seeking for children's oral health among low-income caregivers. *American Journal of Public Health*. 2005; 95(8):1,345-51.
- Komaromy M., Grumbach K., Drake M., Vranizan K., Lurie N., Keane D., Bindman A.B. The role of Black and Hispanic physicians in providing health care for underserved populations. *The New England Journal of Medicine*. 1996; 334(20):1,305-10.

- Kressin N.R., DeSouza M.B. Oral health education and health promotion. *Jong's Community Dental Health*. 5th ed. Gluck G.M., Morganstein W.M., editors. St. Louis: Mosby; 2003. p. 277-328.
- Levi F. Cancer prevention: Epidemiology and perspectives. *European Journal of Cancer*. 1999; 35(14):1,912-24.
- Loesch W.J. Association of the oral flora with important medical diseases. *Current Opinion in Periodontology*. 1997; 4:21-8.
- Marinho V.C.C., Higgins J.P.T., Logan S., Sheiham A. A topical fluoride (toothpastes, mouthrinses, gels, or varnishes) in children and adolescents. *Cochrane Database System Review*. 2003; issue 4.
- McLaughlin J.K., Gridley G., Block G. et al. Dietary factors in oral and pharyngeal cancer. *Journal of the National Cancer Institute*. 1988; 80(15):1,237-43.
- Medicaid Report HISR301A. Active Texas health steps. (Dentists who submitted at least one claim in SFY 2002, by license number – Title V providers, county location of Title V contractor's administrative headquarters and clinics [Title V FFS providers]). 2002.
- Medical Expenditure Panel Survey (MEPS), Migrant Health Program. Migrant health promotion (promoviendo vidas saludables), biennial report 2005-2006. Available from: [www.migranthealth.org](http://www.migranthealth.org).
- Morse D.E., Pendrys D.G., Katz R.V. et al. Food group intake and the risk of oral epithelial dysplasia in a United States population. *Cancer Causes and Control*. 2000; 11(8):713-20.
- Mouradian W.E., Wehr E., Crall J.J. Disparities in children's oral health and access to dental care. *Journal of the American Medical Association*. 2000; 284(2):2,625-31.
- Murdock S.H., White S., Hogue N., Pecolte B., You X., Balkan J. The Texas challenge in the twenty-first century: Implications of population change for the future of Texas. In: Departmental technical report 2002-1. Compiled by the Department of Rural Sociology, Texas A&M University System, The Center for Demographic and Socioeconomic Research and Education. College Station (TX); 2002.
- National Cancer Institute (NCI), Surveillance Epidemiology and End Results (SEER). Information on cancer profiles and cancer data categorized by site, race, and gender available from: <http://statecancerprofiles.cancer.gov/>
- National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP). 2002. Available from: <http://apps.nccd.cdc.gov/nohss/FluoridationV.asp>
- National Center for Education in Maternal and Child Health (NCEMCH). Dental sealant resource guide 2000. Arlington (VA).
- National Health Interview Survey (NHIS), Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH) (1988-1994, 2000, 1998), National Institutes of Health (NIH), National Cancer Institute (NCI). Surveillance, epidemiology, and end results (SEER). 1996-2000; 12 Registry.
- National Health and Nutrition Examination Survey (NHANES). 1988-1994, 1999-2000.
- National Oral Health Surveillance System (NOHSS). Fluoridation status. 2002.
- National Survey of Children's Health (NSCH). Rockland (MD): U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau; 2003.

- National Vital Statistics System (NVSS). 1998.
- Nimias M.K., Fink R., Sollecito W. Oral health status in relation to socioeconomic and ethnic characteristics of urban adults in the U.S.A. *Community Dentistry and Oral Epidemiology*. 1977; 5(5):200-6.
- Offenbacher S. Periodontal infection as a possible risk factor for pre-term low birth weight. *Journal of Periodontology*. 1996; 67(10):1,103-13.
- Offenbacher S., Lieff S., Boggess K.A., Murtha A.P., Madianos P.N., Champagne C.M. et al. Maternal periodontitis and prematurity. Part I: Obstetric outcome of prematurity and growth restriction. *Annals of Periodontal Disease*. 2001; 6(1):164-74.
- Oral Cancer Foundation. Newport Beach (CA); 2008. Available from: <http://www.oralcancerfoundation.org>.
- Phelan J.A. Viruses and neoplastic growth. *Dental Clinics of North America*. 2003; 47(3):533-43.
- Redford M. Beyond pregnancy gingivitis: Bringing a new focus to women's oral health. *Journal of Dental Education*. 1993; 57(10):742-8.
- Reisine S.T., Psoter W. Socioeconomic status and selected behavioral determinants as risk factors for dental caries. *Journal of Dental Education*. 2001; 65(10):1,009-16.
- Ressler-Maerlender J., Krishna R., Robison V. Oral health during pregnancy: Current research. *Journal of Women's Health* [15409996]. 2005; 14(10):880-3.
- Riley J.L., Gilbert G.H. Orofacial pain symptoms: An interaction between age and sex. *Pain*. 2001; 90(3):245-56.
- Sahyoun N.R. Tooth and mouth problems and nutrition among older people. *Generations*. 2004; 28(3):18-24.
- Scannapieco F.A., Bush R.B., Paju S. Periodontal disease as a risk factor for adverse pregnancy outcomes: A systematic review. *Annals of Periodontal Disease*. 2003; 8(1):70-8.
- Shah J.P., Johnson N.W., Batsakis J.G. Oral cancer. London: FDI World Press; 1999.
- Shanks T.G., Burns D.M. Disease consequences of cigar smoking. In: National Cancer Institute monograph. Cigars: Health effects and trends. Smoking and tobacco control. 9th ed. Bethesda (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute; 1998.
- Siegal M.D., Farquhar C.L., Bouchard J.M. Dental sealants: Who needs them? *Public Health Reports*. 1997; 112(2):98-106.
- Siegal M.D., Miller D.L., Moffat D., Kim S., Goodman P. Impact of targeted, school-based dental sealant programs in reducing racial and economic disparities in sealant prevalence among schoolchildren – Ohio 1998-1999. Centers for Disease Control and Prevention. 2001.
- Silverman S.J., Jr. Oral cancer. 4th ed. Atlanta: American Cancer Society; 1998.
- Simmons S., Smith R., Gelbier S. Effect of oral hygiene instruction on brushing skills in preschool children. *Community Dentistry and Oral Epidemiology*. 1983; 11(4):193-8.
- Sinkford J.C., Valachovic R.W., Harrison, S.G. Under-represented minority dental school enrollment: Continued vigilance required.



Journal of Dental Education. 2004; 68(10):1,112.

Steinberg B.J. Women's oral health issues. Journal of Dental Education. 1999; 63(3):271-5.

Taylor G.W. Bidirectional interrelationships between diabetes and periodontal diseases: An epidemiologic perspective. Annals of Periodontal Disease. 2001; 6(1):99-112.

Texas Dental Health Fluoridation Program. 2002.

Texas Administrative Code, Title 25, Part 1, Chapter 49, Rule 49.2. Department of state health services, oral health improvement services. 1986.

Texas Association of Community Healthcare Centers (TACHC). 2008. Available from: [www.tachc.org](http://www.tachc.org).

Texas Behavioral Risk Factor Surveillance System Data (TX BRFSS). 2002-2006.

Texas Birth Defects Registry, Texas Department of State Health Services. Accessed 2008 and available from: [http://www.dshs.state.tx.us/birthdefects/Data/99-04\\_BD\\_Rates\\_TX.xls](http://www.dshs.state.tx.us/birthdefects/Data/99-04_BD_Rates_TX.xls) and [http://www.dshs.state.tx.us/birthdefects/Data/99-04\\_tx\\_race\\_ethnicity.xls](http://www.dshs.state.tx.us/birthdefects/Data/99-04_tx_race_ethnicity.xls)

Texas Cancer Registry 1997-2001, 2003, 2008. Available from: Cancer Epidemiology and Surveillance Branch, Texas Department of State Health Services, 1100 W. 49th St., Austin (TX) 78756 (512.458.7523) and <http://www.dshs.state.tx.us/tcr/default.shtm>

Texas Chip Coalition. Meeting minutes. 2006 Jan 13.

Texas Department of Health (TDH). Water fluoridation costs in Texas: Texas health steps (early and periodic screening, diagnostic, and treatment [EPSDT] – Medicaid). A report fulfilling the House Concurrent Resolution 145, Texas 75th Legislature. 2000.

Texas Department of Health, Bureau of Chronic Disease and Tobacco Prevention (TDHBCDTP), Office of Tobacco Prevention and Control. Texans and tobacco: A report to the 78th Texas Legislature. Submitted in compliance with the Texas Health and Safety Code 161.0901. 2003.

Texas Department of State Health Services (TDSHS). Accessed 2008 and available from: <http://www.dshs.state.tx.us/policy/compact.shtm>

Texas Department of State Health Services (TDSHS). Supply trends among licensed health professions in Texas, 1980-2007 [publication no. 25-11847]. 3rd ed. 2007.

Texas Department of State Health Services (TDSHS), Texas Primary Care Office. Federally qualified health center directory. 2008.

Texas Department of State Health Services (TDSHS), Texas Primary Care Office. Health professional shortage areas (HPSAs) in Texas. Accessed 2008 and available from: <http://www.dshs.state.tx.us/CHS/hprc/hpsa.shtm>

Texas Health and Human Services Commission. 2007. Available from: [http://www.hhsc.state.tx.us/research/CHIP/EnrollmentbyPlan/07\\_12.html](http://www.hhsc.state.tx.us/research/CHIP/EnrollmentbyPlan/07_12.html)

Texas Medicaid and Healthcare Partnership – Texas Health Steps (THSteps). 2007. Available from: [www.txhealthsteps.com](http://www.txhealthsteps.com).

Texas Oral Health Coalition. Meeting minutes. 2005 Jan 3, 2005 Jul 28, 2006 Feb 22, 2006 Apr 13, 2008 Jul 13, 2007 Jan 11. Available from: <http://www.txohc.org/TOHC%20pages/Resources.htm>

Texas State Board of Dental Examiners (TSBDE). 2002, 2007, 2008.

Texas State Data Center (Tables 30a through 30h – 1999). 2000 Census of population, U.S. Bureau of the Census. As compiled by: Texas State Data Center, The University of Texas at San Antonio. 2000. Available from: <http://txsdc.utsa.edu/data/census/2000/sfl/descstab/cog/cogtab-10.txt> and [http://txsdc.utsa.edu/data/census/2000/dp2\\_4/cog/tab-031.txt](http://txsdc.utsa.edu/data/census/2000/dp2_4/cog/tab-031.txt)

Texas State Data Center. Texas population estimates program [online]. As compiled by: Institute for Demographic and Socioeconomic Research, The University of Texas at San Antonio. 2006. Available from: <http://txsdc.utsa.edu/tpepp/txpopest.php> and <http://txsdc.utsa.edu/tpepp/2006ASREstimates/alldata.pdf>

Texas Water Fluoridation Reporting System (WFRS). Water fluoridation costs in Texas: Texas health steps (early and periodic screening, diagnostic, and treatment [EPSDT] – Medicaid). Annual Report 2000. In fulfillment of House Concurrent Resolution 145, Texas 75th Legislature. Available from: <http://www.fluoridationcenter.org/papers/pdf/tdhflstudy.pdf>

Texas Youth Tobacco Survey. 2001.

Tinanoff N., Kanellis M.J., Vargas C.M. Current understanding of the epidemiology mechanisms and prevention of dental caries in preschool children. *Pediatric Dentistry*. 2002; 24(6):543-51.

Tomar S.L., Asma S. Smoking-attributable periodontitis in the United States: Findings from national health and nutritional examination survey III. *Journal of Periodontal Disease*. 2000; 71:743-51.

Tomar S.L., Husten C.G., Manley M.W. Do dentists and physicians advise tobacco users to quit? *The Journal of the American Dental Association*. 1996; 127(2):259-65.

U.S. Behavioral Risk Factor Surveillance System Data. 2006.

U.S. Census Bureau. Current population surveys, 2002-2004. Available from: <http://www.census.gov/hhes/www/poverty.html>

U.S. Census Bureau. Current population survey, annual social and economic supplement. 2006a.

U.S. Census Bureau. State and county quick facts – Texas. 2006b.

U.S. Census Bureau. Poverty thresholds. 2007. Available from: <http://www.census.gov/hhes/www/poverty/threshld/thresh07.html>

U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. Disabilities affect one-fifth of all Americans: Proportion could increase in coming decades. 1997; CENBR/97-5.

U.S. Department of Health and Human Services. Children's dental services under Medicaid: Access and utilization. San Francisco: Department of Health and Human Services, Office of the Inspector General; 1996.

U.S. Department of Health and Human Services. The health consequences of using smokeless tobacco: A report of the advisory committee to the surgeon general [publication no. 86-2874]. Bethesda (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health; 1986. Available from: <http://profiles.nlm.nih.gov/NN/B/B/F/C/>

U.S. Department of Health and Human Services. Healthy people 2010. 2nd ed. Washington (DC): U.S. Government Printing Office; 2000b.

U.S. Department of Health and Human Services. National call to action to promote oral health [NIH publication no. 03-5303]. Rockville (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Dental and Craniofacial Research; 2003.

U.S. Department of Health and Human Services. The health consequences of smoking: A report of the surgeon general. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004a. Available from: [http://www.cdc.gov/tobacco/sgr/sgr\\_2004/index.htm](http://www.cdc.gov/tobacco/sgr/sgr_2004/index.htm)

U.S. Department of Health and Human Services. Healthy people 2010 progress review: Oral health. Washington (DC): U.S. Department of Health and Human Services, Public Health Service; 2004b. Available from: <http://www.healthypeople.gov/data/2010prog/focus21>

U.S. Department of Health and Human Services. Oral health in America: A report of the surgeon general. Rockville (MD): U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000a.

U.S. Department of Health and Human Services. Periodontal (gum) disease: Causes, symptoms, and treatments. National Institutes of Health, National Institute of Dental and Craniofacial Research. 2006.

Watt R., Sheiham A. Inequalities in oral health: A review of the evidence and recommendations for action. *British Dental Journal*. 1999; 187(1):6-12.

Weintraub J.A., Ramos-Gomez F, Jue B., Shain S., Hoover C.I., Featherstone J.D., Gansky S.A. Fluoride varnish efficacy in preventing early childhood caries. *Journal of Dental Restoration*. 2006; 85(2):172-6.

Youth Risk Behavior Surveillance System [online]. Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC).



## APPENDICES

*Appendix A. Data Source Guide for Oral Health Indicators*

Data Source	Website Location	Frequency of Release	Past Release Date	Future Release Dates	Indicator
Synopses of State and Territorial Dental Public Health Programs	<a href="http://apps.nccd.cdc.gov/synopses">http://apps.nccd.cdc.gov/synopses</a>		2008 synopses currently available.	2009 data available in 2010	Healthy people 2010 oral health indicators
Behavioral Risk Factor Surveillance System (BRFSS)	<a href="http://www.cdc.gov/brfss">http://www.cdc.gov/brfss</a>	Annual collection, 6-month lag	April 2009 (2008 data).	2007—optional module only, expected June 2008 April 2011 (2010 data)	Percentage of people who had their teeth cleaned within the past year, visited dentist in past year, and complete tooth loss ages 18 or higher.
Medical Expenditure Panel Survey (MEPS)	<a href="http://www.meps.ahrq.gov/Data/Public.htm">http://www.meps.ahrq.gov/Data/Public.htm</a>	2 years	2005 data currently available	2006 data available in 2009	Dental visit within past 12 months, children and adults ages 2+
National Health Interview Survey (NHIS)	<a href="http://www.cdc.gov/nchs/nhis.htm">http://www.cdc.gov/nchs/nhis.htm</a>	Annual collection, 6-month lag for release	2007 data currently available	2008 data expected June 30, 2009	Oral and pharyngeal cancer exam within past 12 months, age 40+
National Health and Nutrition Examination Survey (NHANES)	<a href="http://www.cdc.gov/nchs/nhanes.htm">http://www.cdc.gov/nchs/nhanes.htm</a>	2 years	2005-2006 data currently available	2007-2008 data expected in 2009	Dental caries (tooth decay experience) Untreated caries Adults with no tooth loss Edentulous (toothless) older adults, aged 65–74 years Periodontal (gum) diseases, adults aged 35–44 years Dental sealants
National Nursing Home Survey (NNHS)	<a href="http://www.cdc.gov/nchs/about/major/nnhsd/nnhsd.htm">http://www.cdc.gov/nchs/about/major/nnhsd/nnhsd.htm</a>	Conducted in 1973-74, 1977, 1985, 1995, 1997, and 1999			Adults' use of oral health care system by residents in long-term care facilities
U.S. Cancer Statistics	<a href="http://apps.nccd.cdc.gov/uscs">http://apps.nccd.cdc.gov/uscs</a>	Data collection is ongoing	1999-2005 data available		Oral and pharyngeal cancer incidence rates and death rates
Water Fluoridation Reporting System (WFRS)	<a href="http://www.cdc.gov/nohss/FSMain.htm">http://www.cdc.gov/nohss/FSMain.htm</a>	Biennially	2006 data available	2008 data expected June 2009	Population served by fluoridated water systems, all

## Appendix B. Acronym References

<b>AAPD</b> .....	American Academy of Pediatric Dentistry	<b>DSHS OHP</b> .....	Department of State Health Services, Oral Health Program
<b>ADA</b> .....	American Dental Association	<b>EPSDT</b> .....	Early and Periodic Screening, Diagnostic, and Treatment
<b>AHRQ</b> .....	Agency for Healthcare Research and Quality	<b>FDA</b> .....	Food and Drug Administration
<b>ASTDD</b> .....	Association of State and Territorial Dental Directors	<b>FFS</b> .....	Fee-for-service
<b>BPHC</b> .....	Bureau of Primary Health Care	<b>FPL</b> .....	Federal Poverty Level
<b>BRFSS</b> .....	Behavioral Risk Factor Surveillance Survey	<b>FQHCs</b> .....	Federally Qualified Health Centers
<b>BSS</b> .....	Basic Screening Survey	<b>HHS</b> .....	Health and Human Services
<b>CDC</b> .....	Centers for Disease Control and Prevention	<b>HHSC</b> .....	Health and Human Services Commission
<b>CDC MMWR</b> .....	Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report	<b>HP 2010</b> .....	Healthy People 2010
<b>CHCs</b> .....	Community Health Centers	<b>HPSA</b> .....	Health Professional Shortage Area
<b>CHIP</b> .....	Children's Health Insurance Program	<b>HRSA</b> .....	Health Resources and Services Administration
<b>CSHCN</b> .....	Children with Special Health Care Needs	<b>IARC</b> .....	International Agency for Research on Cancer
<b>CSHCN-SP</b> .....	Children with Special Health Care Needs, Services Program	<b>IHS</b> .....	Indian Health Services
<b>DHPSA</b> .....	Dental Health Professional Shortage Area	<b>JAMA</b> .....	Journal of the American Medical Association
<b>DSHS</b> .....	(Texas) Department of State Health Services	<b>LCSW</b> .....	Licensed Clinical Social Worker
<b>DSHS BSS</b> .....	Department of State Health Services, Basic Screening Survey	<b>MCH Program</b> .....	Maternal and Child Health Program
<b>DSHS CHS HPRC</b> ....	Department of State Health Services Center for Health Statistics, Health Professional Resource Center	<b>MEPS</b> .....	Medical Expenditure Panel Survey
		<b>MHP</b> .....	Migrant Health Program
		<b>MMWR</b> .....	Morbidity and Mortality Weekly Report
		<b>MNP</b> .....	Medically Needy Program

<b>NASBHC</b> .....	National Assembly of School-based Health Care	<b>TDHA</b> .....	Texas Dental Hygienists' Association
<b>NCEMCH</b> .....	National Center for Education in Maternal and Child Health	<b>TDHBCDTP</b> .....	Texas Department of Health, Bureau of Chronic Disease and Tobacco Prevention
<b>NCHS</b> .....	National Center for Health Statistics	<b>TDHEA</b> .....	Texas Dental Hygiene Educators' Association
<b>NCI</b> .....	National Cancer Institute	<b>TFP</b> .....	Texas Fluoridation Project
<b>NHANES</b> .....	National Health and Nutrition Examination Survey	<b>THA</b> .....	Texas Health Association
<b>NHE</b> .....	National Health Expenditure	<b>THSteps</b> .....	Texas Health Steps
<b>NHIS</b> .....	National Health Interview Survey	<b>TSBDE</b> .....	Texas State Board of Dental Examiners
<b>NIH</b> .....	National Institutes of Health	<b>TSDC</b> .....	Texas State Data Center
<b>NNHS</b> .....	National Nursing Home Survey	<b>TX BRFSS</b> .....	Texas Behavioral Risk Factor Surveillance System
<b>NOHSS</b> .....	National Oral Health Surveillance System	<b>TxOHC</b> .....	Texas Oral Health Coalition
<b>NSCH</b> .....	National Survey of Children's Health	<b>TX HHSC</b> .....	Texas Health and Human Services Commission
<b>NVSS</b> .....	National Vital Statistics System	<b>U.S. DHHS</b> .....	U.S. Department of Health and Human Services
<b>OHI</b> .....	Texas Oral Health Improvement Act	<b>WFRS</b> .....	Texas Water Fluoridation Reporting System
<b>SEER</b> .....	Surveillance Epidemiology and End Results	<b>WIC Program</b> .....	Women, Infants, and Children's Program
<b>SES</b> .....	Socioeconomic Status		
<b>SFY</b> .....	State Fiscal Year		
<b>TACHC</b> .....	Texas Association of Community Healthcare Centers		
<b>TAPD</b> .....	Texas Academy of Pediatric Dentists		
<b>TDA</b> .....	Texas Dental Association		
<b>TDH</b> .....	Texas Department of Health		





## ACKNOWLEDGEMENTS

---

**Texas Department of State Health Services**  
**Division of Family and Community Health Services**  
**Office of Program Decision Support**

*Brian C. Castrucci*, MA, Manager  
*Gita Mirchandani*, PhD, MPH, Research Specialist  
*Kimberly Petrilli*, MSPH, MSW, Program Specialist  
*M. Aaron Sayegh*, PhD, MPH, Research Specialist  
*Margaret Vaaler*, PhD, Research Specialist

**Case Management and Screening Unit**

*Linda Altenhoff*, DDS, State Dental Director, Oral Health Program  
*Margaret Bruch*, LCSW, Manager  
*Ellen Castrucci*, Training Specialist  
*Maria Vega*, MPA, Texas Health Steps Branch Manager

**CDC Division of Oral Health Advisors**

*Jessamyn Ressler-Maerlender*, MPH  
*Laurie K. Barker*, MSPH  
*Linda S. Orgain*, MPH  
*Scott M. Presson*, DDS, MPH

DSHS OHP acknowledges the funding and technical support received from the Division of Oral Health at the Centers for Disease Control and Prevention, Atlanta, Georgia, in making this document available to the citizens of Texas as provided through Cooperative Agreement No. U58/CCU622789-02.





Department of State Health Services  
Oral Health Program  
1100 West 49th Street  
P.O. Box 149347  
Austin, Texas 78714-9347  
512-458-7323  
[www.dshs.state.tx.us/dental/default.shtm](http://www.dshs.state.tx.us/dental/default.shtm)

